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BLS Report No. 1

COLLECTIVE BARGAINING STRUCTURES:

The Employer Bargaining Unit

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A Study in Industrial Relations

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

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Collective Bargaining Structures:

The Employer Bargaining Unit

A Study in Industrial Relations

UNITED STATES DEPARTMENT OF LABOR
Martin P. Durkin - Secretary
BUREAU OF LABOR STATISTICS
Ewan Clague - Commissioner
WASHINGTON 25, D.C.
FEBRUARY 1953

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* * * * *

February 19, 1953

The Employer Bargaining Unit [1]

As collective bargaining developed through the years, many types of bargaining structures evolved. In most cases these structures developed gradually as employers and unions sought to adapt to changes in economic circumstances, relative bargaining power, and other conditions. Changes in bargaining structures generally reflect efforts to find the best possible bargaining arrangement for the parties, for both negotiation and contract administration.

On one side of the bargaining table, the employer unit may range from one employer with one or more plants to an association covering virtually an entire industry. On the other side, the employee unit may consist of an industrial or craft union, or various mixtures of these types with local, regional, or national representation, or a group of unions working together in a trades department or other special bargaining combination. The type and character of the units of bargaining vary among industries, among areas, and within industries and areas.

The purpose of this study is limited to an analysis of employer bargaining units. From the point of view of scope and jurisdiction, two broad types of employer bargaining units can be distinguished. The first, the single-employer unit, represents bargaining by single plants or by more than one plant under a common management. Thus, single-employer contracts range from the purely local agreements, negotiated for a single plant with one or more unions, to agreements covering all plants of a far-flung corporation.

The second broad type of bargaining unit, the multiemployer bargaining unit, provides several distinct kinds of contracts. Form contracts are identical agreements signed by different employers practically always at the request of the union. They are found most frequently where there are a large number of small competing business organizations, particularly within a metropolitan area. These agreements are classified as multiemployer principally because the terms of the contract are applied uniformly to employers who may not have participated in the actual negotiations. The trucking industry provides many examples.

Another type of multiemployer contract, found rather infrequently, is that in which employers jointly participate in contract negotiations, without, however, being members of any formal association. By far the most prevalent of all the types of multiemployer bargaining is association bargaining, which is carried on by groups of employers combining for the purpose of negotiating contracts with labor unions. The association may range from an organization which meets only during contract negotiations to an elaborate organization with a constitution, bylaws, and a regular staff of officers. Between these extremes are many variations in organization and procedure, which follow no fixed pattern by industry, region, or stage of collective bargaining development. Federations of associations are occasionally organized, usually in the same locality, to conduct negotiations on a correspondingly broader scale.

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[1] Prepared by Theodore W. Reedy, assisted by Gloria Johnson, in the Division of Wages and Industrial Relations.

Extent of Multiemployer Bargaining

Analysis of collective-bargaining agreements, 2/ covering 8,410,000 workers, shows that one-third of the workers are under agreements signed by groups of employers or employer associations. The remaining two-thirds of the workers are covered by agreements negotiated by single employers. Railroad agreements were not included in this analysis. In view of the practice of nationwide bargaining on wages in the railroad industry, and making allowances for agreements not accounted for, it appears probable that as many as 5 million workers are involved in multiemployer bargaining.

Of the agreements analyzed, approximately five-sixths, covering about 5,750,000 workers (68 percent), were negotiated on the basis of single-employer units, whereas one-sixth, covering 2,660,000 workers (32 percent), were negotiated on a multiemployer basis. Thus, it is clear that agreements with single employers remain the predominant type.

Multiemployer Bargaining by Industry.--Table 1 presents a distribution of industries or industry groups according to the estimated percentage of workers covered by multiemployer bargaining agreements. In some instances, widely different degrees of coverage were found among industry classifications making up a major industry group. Wherever possible, the major group is omitted and the finer breakdown is used to present a more detailed picture. The basis for the percentage of workers covered by multiemployer bargaining (table 1), is the number of workers under agreement within an industry or industry group, rather than the total number employed in that industry. Thus, although a

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2/ A sample of 11,460 agreements, current in 1951, was used for this study. These agreements, on file in the Bureau of Labor Statistics, covered about 8,410,000 workers. Seventy percent of these agreements covering 66 percent of the workers were in manufacturing industries; the rest were in nonmanufacturing, excluding railroads. This sample was used for tables 1-4, which show the extent of single-employer and multiemployer types of bargaining by industry, union, and region. No finer breakdown of employer-unit by types was possible from this sample, but a special analysis was made of 3,428 single-employer agreements and 641 multiemployer agreements, current as of March 1952, to obtain the more complete breakdown of types of units shown in table 5.

high percentage (60-79) of workers under contract in retail trade are involved in multiemployer bargaining, only a relatively small proportion of the more than 7 million retail-trade workers are organized or covered by contracts.

By far more industries are found in the group having less than 20 percent of the workers under multiemployer bargaining. The producers of metals and machinery and other durable goods are found in this group.

The next largest group is at the opposite end of the scale, with 80-100 percent of the workers in each industry under multiemployer bargaining. Only one manufacturing industry, the apparel industry (men's and women's clothing), appears in this group. With the sole exception of the service industries, these industries are well organized. The 20-39, 40-59, and 60-79 percentage groups have only 17 industries among them.

A scattered group of service industries, in which it is believed a high proportion of the workers under agreement are covered by multiemployer bargaining, are not shown in the table because too few agreements were available for analysis. This group includes automobile and miscellaneous repair services; motion picture, amusement, and recreation services; and some health, education, and other professional services.

Multiemployer Bargaining by Unions.--More than three-fourths of the 200-odd national and international unions were represented in the contracts analyzed. For 119 of these unions, a sufficient number of contracts were analyzed to determine the proportion of workers subject to multiemployer bargaining. Unions of Government workers, railroad unions, and unions for which no current contracts were available or the number of contracts was too small account for those not included (table 2).

The distribution of unions in the various percentage ranges corresponds broadly to the distribution of industries (table 1) according to the principal industries which the unions organize. For example, the International Ladies' Garment Workers' Union (AFL) and the Amalgamated Clothing Workers of America (CIO) are found in the 80-100 percent group. Both the men's and women's clothing industries are in the same relative position in the industry table. Coal mining, in the 80-100 percent range in the industry table, is paralleled by the United Mine Workers in the same range in the union table. Most of the building construction unions are found in the 80-100 percent range, as is the construction industry.

About 40 percent of the unions have less than 20 percent of the workers which they represent under multiemployer agreements. Here again the union-industry parallel generally holds. The unions organizing the metals, machinery, and other heavy industries are in this group. For example, the Steelworkers (CIO), Machinists (AFL), Electrical, Radio and Machine Workers (CIO), and Automobile Workers (CIO) are all in the 0-19 percent group.

Ten percent of the 119 unions represented have 20-39 percent of their workers covered by multiemployer bargaining; slightly more than 8 percent have 40-59 percent so covered, and 12 percent have 60-79 percent. The group of unions having 80-100 percent of their workers covered by multiemployer agreements included 36 unions, or 30 percent of the total number.

The percentage of collective bargaining agreements negotiated by each union through multiemployer negotiations often bears no relation to the percentage of workers covered by such agreements (table 3). However, for slightly less than half the unions (57 out of 119) the proportion of contracts and workers falls within the same percentage brackets. Thirty-eight percent of the unions (45) have both workers and contracts in the lowest (0-19) percentage group.

Multiemployer Bargaining by Region.--Marked variations exist in the types of bargaining among the various regions of the United States (table 4). The Pacific Coast region, covering California, Oregon, and Washington, has by far the largest percentage of its workers under agreements (71 percent) subject to multiemployer bargaining. The Middle Atlantic region, consisting of New York, New Jersey, and Pennsylvania, is next in rank with 42 percent under multiemployer agreements. The Mountain States also show a high incidence of multiemployer bargaining, but the number of contracts existing in this predominantly nonindustrial area is small. Many employees in the New England and West North Central regions are also under multiemployer bargaining.

The East North Central region, consisting of the highly industrialized States of Ohio, Indiana, Illinois, Michigan, and Wisconsin, is notable for its comparatively small percentage of multiemployer contracts. This may be due, in part, to the high percentage of large employer-large union agreements in this area.

The South, with its relatively limited unionization, shows little multiemployer bargaining. The South Atlantic and East and West South Central regions all show low percentages of contracts and employees under multiemployer bargaining. Analysis of the South Atlantic region discloses a high proportion of the multiemployer bargaining in this area in Maryland and the District of Columbia, with the States south of the Potomac River having only 8 percent of covered employees under multiemployer agreements.

Multiemployer Bargaining by Type.--A special analysis was made of 3,428 single-employer agreements and 641 multiemployer agreements to obtain a finer breakdown of employer-unit types than was possible for the sample of 11,460 agreements, upon which the preceding data were based.

Those agreements negotiated between a union and an employer with one or more plants in the same location accounted for 89 percent of the 3,428 single-employer agreements. Agreements negotiated by a union with a single employer for plants in more than one location made up the remaining 11 percent of the agreements, but accounted for 53 percent of the 3,152,000 workers covered by the single-employer agreements. This type of bargaining is exemplified by the agreement between the United Automobile Workers (CIO) and General Motors Corporation.

Among the various types of multiemployer bargaining units, the association signing agreements for its members was most extensive, accounting for 59.6 percent of the 641 multiemployer agreements and 88.8 percent of the workers covered by these agreements (table 5).

Other types of multiemployer agreements are signed not by an association but by the individual employers who are parties to the contract. Two of these agreement types are those negotiated by an association, with individual signatories, and joint signers (not association members) to a single agreement. Together these accounted for 17.3 percent of the multiemployer agreements and 4.7 percent of the workers.

Form agreements, which may be defined as identical contracts signed by individual employers, accounted for 22 percent of the multiemployer agreements and 6.2 percent of the workers covered by them.

Determination of the Employer Bargaining Unit in Disputes

The National Labor Relations Board is empowered to determine the scope of the bargaining unit for purposes of union representation in case of a dispute between a union and an employer that cannot be resolved by the parties.

The Board has consistently held that each case must be resolved in the light of its own individual set of circumstances. Facts given consideration are the history of collective bargaining in the particular situation, and in like situations in the same industry; the mutuality of interest among groups of workers as to wages, hours, working conditions; eligibility for membership in the union or unions involved; and any other applicable criterion of common or diverse interest.

The Board also has held that maintenance of past practice facilitates collective bargaining in the absence of evidence that change in the pattern has become necessary. In a recent case the Board held that a requested Nation-wide bargaining unit of employees in all plants of a single employer was inappropriate because of (1) the long history of collective bargaining on a local area (multiemployer) basis; (2) the local autonomy of the branch plants; and (3) the local nature of the business.

> Especially significant on the appropriateness of the unit is the long history of collective bargaining on a local area, multiemployer basis . . . This pattern of bargaining was created and continued by voluntary action of labor organizations

> representing various employee groups . . . and of employers. Until the present controversy arose, it apparently operated to the satisfaction of all parties concerned . . . So far as it lies within the Board's power, we should not upset traditional methods of bargaining except for very cogent reasons . . . 3/

In another recent case, the Board held that a company-wide bargaining unit coextensive with the entire organization was appropriate. This case involved a group of professional employees of a large electrical company. In its findings the Board cited the similarity of specialized experience of workers as among plants and their community of interest, the transferability of workers between various locations, the ultimate control of all operations in a central headquarters, and the collective bargaining history of the company and the union. 4/ The Board has approved bargaining units of individual employers with more than one plant in other cases, particularly where plants are interdependent.

The Board also has indicated that it would not approve severance of a plant or plants from a multiplant, multiemployer bargaining unit, especially where the several employers have been members of an association which has bargained with a single union representing their employees. On occasion the unit recognized has been district- or region-wide, as in shipping by water, or industry-wide, as in the case of anthracite coal mining. In the latter case, the Board has stated that:

> We are convinced that the full benefits of their right to self-organization and to collective bargaining cannot be insured to the employees by breaking up the collective bargaining unit which has been established by a long history of contractual relations between the operators and miners of the anthracite region. . . . 5/

The Board has indicated that generally it will find a multiemployer unit appropriate "if there is a controlling bargaining history on a multiemployer basis. For this purpose, neither the lack of a formal association of employers nor the fact that the results of joint negotiations have been incorporated in separate uniform contracts is determining. The inclusion of employees in a multiemployer unit depends primarily on whether the employer intends to be bound, or is in fact bound, by joint negotiations. Thus, in one case during the past year, the Board said:

> 'It is the participation for a substantial period of time in joint bargaining negotiations and the uniform

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3/ Continental Baking Co., 99 NLRB 123 (1952).

4/ Western Electric Co., Inc., 98 NLRB 154 (1952).

5/ Stevens Coal Co., 19 NLRB 98, 110 (1940).

> adoption of the agreements resulting from such negotiations that indicates a desire on the part of the participants to be bound by joint, rather than individual, action and warrants the establishment of the multiemployer unit. . . .'

"However, an employer's intention to be bound by the joint negotiations of an association is not sufficient where the employer is not a member of the association and the association will act as a bargaining agent only for its members." 6/

The Board also has decided that a history of multiemployer bargaining is not necessarily controlling if the unit is inherently inappropriate, or if the employer has "effectively abandoned joint bargaining."

6/ Sixteenth Annual Report of the NLRB, 1951, pp. 102-103.

TABLE 1.--Estimated percentage of workers under union agreements covered by multiemployer bargaining, by industry, 1951 1/

0-19 percent	20-39 percent
Bus lines, intercity Cement Chemicals Communications Confectionery Cotton textiles Crude petroleum and natural gas Dairy products Electrical machinery Fabricated metal products Flour and other grain products Furniture and fixtures Knit goods, except hosiery Local railways and bus lines Machinery, except electrical Meat packing Metal mining Nonferrous metals and products Nonmetallic mining and quarrying Ordnance Paper and allied products Products of petroleum and coal Professional and scientific equipment Rubber products Silk and rayon textiles Steel, basic Steel products Stone and clay products Sugar, beet and cane Tobacco manufacture Transportation equipment Utilities Wool carpets and rugs Woolen and worsted textiles	Beverages, nonalcoholic Hosiery Local utilities and public service (not elsewhere classified) Lumber and wood products

40-59 percent	60-79 percent	80-100 percent
Building service and maintenance Finance, insurance, and real estate Leather and leather products Newspapers and periodicals Wholesale trade	Baking Book and job printing Canning and preserving Dyeing and finishing textiles Glass and glassware Malt liquors Pottery and related products Retail trade	Clothing, men's Clothing, women's Coal mining Construction Hotels, rooming houses, and camps Longshoring Maritime Personal services Services allied to transportation Trucking and warehousing

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1/ Based on collective-bargaining agreements on file with the Bureau of Labor Statistics in 1951. Industry classification is based on the Standard Industrial Classification Manual issued by the Bureau of the Budget. Some major industry groups have been broken down into component industries to show variations in the degree of multiemployer bargaining.

TABLE 2.--Distribution of unions by the estimated percentage of workers represented under multiemployer bargaining, 1951 1/

0-19.9 percent	20-39.9 percent
Automobile Workers, United (CIO)	Boilermakers, Iron Ship Builders, Blacksmiths (AFL)
Automobile Workers of America (AFL)	Brick and Clay Workers of America (AFL)
Broadcast Engineers, Natl. Assn. of (CIO)	Electrical Workers, Intl. Bro. of (AFL)
Cement, Lime and Gypsum Workers (AFL)	Furniture Workers of America (CIO)
Chemical Workers Union, Intl. (AFL)	Glass Bottle Blowers Assn. (AFL)
Communications Workers of America (CIO)	Marble, Slate and Stone Polishers, Rubbers and Sawyers (AFL)
Communications Assn., American (Ind.)	Masters, Mates and Pilots (AFL)
Coopers Intl. Union (AFL)	Pattern Makers' League (AFL)
Die Sinkers Conference, Intl. (Ind.)	Pulp, Sulphite and Paper Mill Workers (AFL)
Distillery, Rectifying and Wine Workers (AFL)	Retail, Wholesale and Department Store Union (CIO)
Electrical, Radio and Machine Workers, Intl. Union of (CIO)	Textile Workers Union (CIO)
Electrical, Radio and Machine Workers of America, United (Ind.)	Woodworkers of America (CIO)
Engineers, Federation of Technical (AFL)	
Firemen and Oilers, Intl. Bro. of (AFL)	
Garment Workers of America (AFL)	
Gas, Coke and Chemical Workers (CIO)	
Glass, Ceramic and Silica Sand Workers (CIO)	
Glove Workers Union of America (AFL)	
Grain Millers, American Fed. of (AFL)	
Leather Workers, Intl. (AFL) 2/	
Machinists, Intl. Assn. of (AFL)	
Marine and Shipbuilding Workers (CIO)	
Mechanics Educational Society (Ind.)	
Metal Polishers, Buffers, Platers and Helpers (AFL)	
Mine, Mill and Smelter Workers (Ind.)	
Mine Workers, District 50 (Ind.)	
Newspaper Guild, American (CIO)	
Office Employees' Intl. Union (AFL)	
Oil Workers Intl. Union (CIO)	
Optical and Instrument Workers (CIO)	
Packinghouse Workers of America (CIO)	
Packinghouse Workers, Natl. Bro. of (Ind.)	
Paper Makers, Intl. Bro. of (AFL)	
Paperworkers of America (CIO)	
Playthings, Jewelry and Novelty Workers (CIO)	
Rubber, Cork, Linoleum and Plastic Workers (CIO)	
Shoe Workers Union, Boot and (AFL)	
Steelworkers of America, United (CIO)	
Stone and Allied Prod. Workers (CIO)	
Stove Mounters Intl. Union (CIO)	
Street, Electric Railway and Motor Coach Employees (AFL)	
Telegraphers Union, Commercial (AFL)	

See footnotes at end of table.

TABLE 2.--Distribution of unions by the estimated percentage of workers represented under multiemployer bargaining, 1951 1/ - Continued

0-19.9 percent	20-39.9 percent
Textile Workers of America (AFL) Tobacco Workers Intl. Union (AFL) Transport Service Employees (CIO) Transport Workers Union of America (CIO) Watch Workers Union, American (Ind.)	

40-59.9 percent	60-79.9 percent
Bakery and Confectionery Workers Intl. Union (AFL) Bookbinders, Intl. Bro. of (AFL) Engineers, Intl. Union of Operating (AFL) Fur and Leather Workers Union, Intl. (Ind.) Jewelry Workers Union, Intl. (AFL) Meat Cutters and Butcher Workmen, Amalgamated (AFL) Molders and Foundry Workers Union (AFL) Printing Pressmen and Assistants' Union (AFL) Shoe Workers of America, United (CIO) Upholsterers Intl. Union (AFL)	Brewery, Flour, Cereal, Soft Drink and Distillery Workers (CIO) Bridge, Structural and Ornamental Iron Workers (AFL) Building Service Employees' Intl. Union (AFL) Cigar Makers Intl. Union (AFL) Glass Workers Union, American Flint (AFL) Hosiery Workers, American Federation of (AFL) Longshoremen's and Warehousemen's Union (Ind.) Mailers Union, Intl. (Ind.) Marine Engineers' Beneficial Assn. (CIO) Retail Clerks Intl. Assn. (AFL) Seafarer's Intl. Union (AFL) Stone Cutters' Assn., Journeymen (AFL) Teamsters, Chauffeurs, Warehousemen and Helpers of America (AFL)

80-100 percent
Asbestos Workers, Intl. Assn. of Heat and Frost Insulators (AFL) Barbers, Hairdressers, Cosmetologists, and Proprietors Intl. Union (AFL) Bricklayers, Masons and Plasterers Intl. Union (AFL) Carpenters and Joiners of America (AFL) Cleaning and Dye House Workers, Intl. Assn. of (AFL) Clothing Workers of America, Amalgamated (CIO) Elevator Constructors, Intl. Union of (AFL) Garment Workers' Union, Intl. Ladies' (AFL) Glass Cutters' League of America, Window (AFL) Granite Cutters' Intl. Assn. of America (AFL) Handbag, Luggage, Belt and Novelty Workers' Union (AFL) Hatters, Cap and Millinery Workers Intl. Union (AFL) Hod Carriers', Building and Common Laborers' Union, Intl. (AFL) Hotel and Restaurant Employees and Bartenders Intl. Union (AFL) Lathers, Intl. Union of Wood, Wire and Metal (AFL) Laundry Workers' Intl. Union (AFL) Lithographers of America, Amalgamated (CIO) Longshoremen's Assn., Intl. (AFL) Marine Firemen, Oilers, Watertenders and Wipers Assn. (Ind.)

See footnote at end of table.

TABLE 2.--Distribution of unions by the estimated percentage of workers represented under multiemployer bargaining, 1951 1/ - Continued

80-100 percent
Maritime Union of America, National (CIO)
Mine Workers of America, United (Ind.)
Musicians, American Federation of (AFL)
Newspaper and Mail Deliverers' Union of N. Y. and Vicinity (Ind.)
Painters, Decorators and Paperhangers of America (AFL)
Photo-Engravers' Union of North America (AFL)
Plasterers' and Cement Masons' Intl. Assn. (AFL)
Plumbing and Pipe Fitting Industry, Journeymen and Apprentices of the (AFL)
Potters, National Bro. of Operative (AFL)
Radio Assn., American (CIO)
Roofers, Damp and Waterproof Workers Assn. (AFL)
Sheet Metal Workers' Intl. Assn. (AFL)
Shoe and Allied Craftsmen, Bro. of (Ind.)
Stage Employees and Moving Picture Machine Operators, Theatrical (AFL)
Stereotypers' and Electrotypers' Union, Intl. (AFL)
Typographical Union, Intl. (AFL)
Wall Paper Craftsmen and Workers, United (AFL)

1/ Based on collective-bargaining agreements on file with the Bureau of Labor Statistics in 1951.

2/ Merger with the Amalgamated Meat Cutters and Butcher Workmen (AFL) approved by the AFL Executive Council May 14, 1951.

TABLE 3.--Distribution of 119 unions, by percent of workers and of contracts under multiemployer bargaining, 1951 1/

Number of unions	Percent of workers					Percent of contracts				
	0-19	20-39	40-59	60-79	80-100	0-19	20-39	40-59	60-79	80-100
45	X					X				
2	X						X			
2		X					X			
9		X				X				
1		X						X		
3			X					X		
3			X			X				
4			X				X			
4				X		X				
5				X			X			
3				X				X		
2				X					X	
3					X	X				
6					X		X			
12					X			X		
10					X				X	
5					X					X

1/ Based on collective-bargaining agreements on file with the Bureau of Labor Statistics in 1951.

TABLE 4.--Single employer and multiemployer agreements, by region, 1951 1/

Region	Percent of contracts		Percent of employees	
	Single employer	Multi-employer	Single employer	Multi-employer
Interstate-Interregion agreements	72	28	72	28
New England	89	11	76	24
Middle Atlantic	85	15	58	42
East North Central	90	10	89	11
West North Central	84	16	79	21
South Atlantic	90	10	87	13
East South Central	92	8	93	7
West South Central	94	6	92	8
Mountain	74	26	61	39
Pacific	62	38	29	71

1/ Based on collective-bargaining agreements on file with the Bureau of Labor Statistics in 1951.

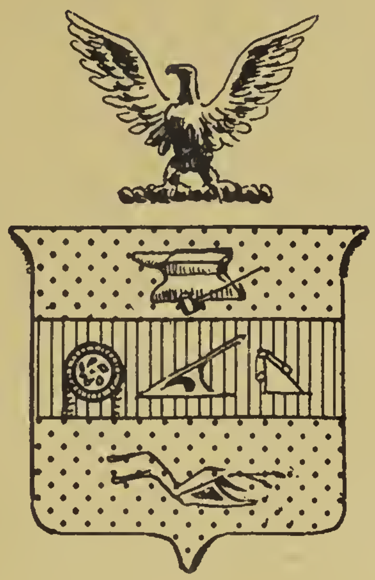
TABLE 5.--Types of multiemployer units in collective bargaining, by number and percent of contracts and of employees, 1952 1/

Type of bargaining unit	Contracts		Employees	
	Number	Percent	Number	Percent
Total	641	100.0	2,228,707	100.0
Agreements signed by Association for its members	382	59.6	1,978,884	88.8
Agreements negotiated by Association, individual signatories	40	6.2	49,646	2.2
Joint signers to single agreement	71	11.1	55,325	2.5
Form agreements (identical agreements signed by each company)	141	22.0	139,062	6.2
Other	7	1.1	5,790	.3

1/ Based on selection of 641 collective-bargaining agreements on file with the Bureau of Labor Statistics, as of March 1, 1952.

BLS Report No. 2

New and Maintenance Construction



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Construction in the 1947 Interindustry Relations Study

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

NEW AND MAINTENANCE CONSTRUCTION

[I-O [illegible]]

Construction
in the
1947 INTERINDUSTRY RELATIONS STUDY

BLS Report No. 2

United States Department of Labor
Martin P. Durkin, Secretary

Bureau of Labor Statistics
Ewan Clague, Commissioner

Washington 25, D. C.
February 1953

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Construction in the 1947 Interindustry Relations Study

NEW AND MAINTENANCE CONSTRUCTION

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The construction expenditures estimates presented herein apply only to the 1947 Interindustry Relations Study. For many types of construction they show differences from the construction expenditures for 1947 estimated jointly by the U. S. Departments of Commerce and Labor. The principal reasons for these differences are mentioned in the text. The expenditures figures of this report are intended for use in interindustry relations analysis; they are not presented as a replacement of the Commerce-Labor estimates.

Construction in the 1947 Interindustry Relations Study

NEW AND MAINTENANCE CONSTRUCTION *

Chapter I Scope and Definition

A. Introduction

Construction activity, as defined within government, is one of the largest industrial sectors in the economy. With an output, estimated in the interindustry study, of almost $29 billion and with more than 4 million persons actively engaged in it, the construction industry purchases material and nonmaterial inputs from practically every other sector, and is a particularly large buyer of important materials and critical labor force skills. Its output, both new and maintenance construction, is sold throughout the country and to every segment of the economy.

Though it has been labeled an "industry" by all who have an acquaintance with it, statistical or otherwise, it is in only the broadest sense that this variegated group of completely dissimilar activities can be considered comparable with any other "industry" group. For example, under "new construction," the concept includes the sinking of wells for crude petroleum and natural gas, the paving of playgrounds for children, and the erection of skyscrapers. It also includes the maintenance and repair of railroads, highways, and private homes. Even within a construction category the differences may be so great as to almost obliterate any semblance of similarity, except in the mind of the construction statistician. For example, commercial construction includes such different components as service stations and department stores.

In the interindustry study, construction has been defined as an activity, i.e., the output includes work done by force account in addition to that by construction contractors. This definition, on an activity basis, differs from the establishment concept which was used in defining manufacturing and other sectors in the study. It is, however, comparable with definitions used for some of the service industries, and is basically similar to product definitions used in agriculture and mining. Even had it been desirable to define construction on an establishment basis, it would have been an impossible task with presently available data to

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* By David I. Siskind of the Division of Interindustry Economics, Bureau of Labor Statistics, U. S. Department of Labor. The study leading to this report was under the general supervision of Sidney A. Jaffe. Mr. Jaffe, Gabriel Cherin, Jacob Lotven, Alexander Findlay, and others were generous with various helpful suggestions. The author is especially grateful to Philip M. Ritz for suggestions, comments, and thorough review.

distribute even the total expenditures for contract construction among the three major types of general contractors (building, highway, and heavy engineering), and a dozen or so important special trade contractors (such as plumbing, painting, carpentering, and roofing).

The very nature of construction requires that it be given special treatment in an interindustry chart. For presentation purposes, in a transaction chart, it is shown as any other endogenous sector with allocations on a current account basis to purchasing sectors (its private maintenance and repair component), as other current allocations to government sectors (both new and maintenance public construction), and as capitalized allocations to the Gross Private Capital Formation sector (all private new construction). However, in application of the chart to specific problems, production or otherwise, it is practically always advisable to treat all of construction as an exogenous sector -- specified autonomously by outside considerations and not as functionally derivable from interrelationships with other sectors.

This is obviously justifiable for new construction which is similar to any other component of final demand. For the maintenance and repair component the decision is mostly an administrative one, based on the intuitive belief that these expenditures can be more accurately stipulated (specified autonomously), than derived as a result of structural interrelationships. In any event, it is clear that maintenance expenditures are rarely if ever linearly related to current production, and, in fact, it is doubtful that any structural relationship, linear or not, appears consistently.

B. Definition of Construction

Construction can be variously defined. It is essential, therefore, to indicate at the outset those activities and types of facilities to which the term construction expenditures 1/ has been applied in the interindustry relations study. The task of delimiting the area of construction has been simplified considerably through the work in this field of the Division of Construction Statistics, Bureau of Labor Statistics (BLS), U. S. Department of Labor, and the Building Materials Division, Facilities and Construction Bureau, National Production Authority, U. S. Department of Commerce 2/ (formerly the Construction Division, U. S. Department of

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1/ The terms construction activity, construction expenditures, and value of work put-in-place will be used synonymously in this presentation.

2/ The Departments of Commerce and Labor are jointly responsible for new construction estimates. Maintenance and repair data, however, are prepared exclusively by the Department of Commerce.

Commerce). Over a period of years these agencies have worked cooperatively to establish a standard definition of construction and to develop a series of criteria for determining whether certain facilities should be included or excluded from the construction expenditure series for which both agencies are jointly responsible.

Construction activity has been defined as the design, production, and maintenance of fixed works and structures. Because this definition is so all-inclusive and not necessarily definitive, it is not sufficient for interindustry purposes. The definition of construction must be more detailed and descriptive in character. The current Commerce-Labor concepts provide the basis for determining the limitations of construction activity for this study.[3] Construction is herein defined as the design, erection, maintenance, and repair of immobile structures and utilities together with those service facilities which become an integral part of the structure.

In the above definition, structures include buildings, dams, reservoirs, levees, canals, docks, highways, bridges, tunnels, airfields, railroads, street railways, track and roadway, towers, storage tanks, and all similar works. Utilities comprise electric light and power transmission and distribution lines, telephone and telegraph lines, petroleum and gas transmission and distribution lines, and water supply and sewage collection lines. Service facilities included under construction activity cover those types of equipment which upon installation become an integral part of the structure, e.g. plumbing, heating, electrical work, air conditioning, and elevators. Additions and alterations to, and maintenance and repair of existing structures and utilities and service facilities as outlined above are also considered construction. Production equipment and any facility not a component part of the structure are excluded.

The output of the construction industry includes the work done by construction contractors (which are the firms constituting the industry according to standard definitions), by force account workers, and nonpaid

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[3] A complete review of definitions, sources, and techniques involved in deriving the current construction activity expenditures can be found in Expenditures for New Construction, 1915-50, August 1951, U. S. Department of Labor, Bureau of Labor Statistics, Division of Construction Statistics, pp. 20-35, (hereinafter referred to as Expenditures for New Construction); and Construction and Building Materials, Statistical Supplement, May 1951, U. S. Department of Commerce, National Production Authority, Facilities and Construction Bureau, Building Materials Division, pp. 78-88 (hereinafter referred to as Statistical Supplement). The former contains a more detailed set of definitions for each type of construction activity (pp. 29-35).

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

labor. 4/ Except for work done on owner-built homes, the imputed value of nonpaid labor and materials acquired without cost is, however, excluded from the level of expenditures. 5/ The cash outlay for materials put-in-place by the unpaid labor is included in the estimate. This situation is particularly common in all types of farm construction 6/ and fairly prevalent for certain types of additions, alterations, improvements, maintenance and repair work on owner-occupied residential dwelling units. Hence the physical volume of construction activity as measured by expenditures is understated to the extent that noncash outlays are excluded from the level of expenditures (table 1).

The interindustry analysis also includes a number of activities not in the current Commerce-Labor series, e.g. oil and gas well drilling, 7/ farm land betterment, and various maintenance and repair activities at military and naval installations, conservation and development facilities, miscellaneous public service enterprises, publicly owned local transit

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4/ "Force account construction" is defined as construction for its own use that is accomplished by a private business organization not in the construction industry or a governmental unit which acts as its own general contractor and carries out the work by means of employees on its own payroll. Unpaid workers include those (property owners, members of their family, and others) who are actually unpaid, and also those (farm workers, and others) who are hired and paid for other duties, but who do a limited amount of construction (usually maintenance and repair) when not needed for their primary work.

5/ Residential permit valuations are calculated on a commercial value basis and implicitly impute a value to nonpaid labor on owner-built homes and to any materials obtained without cost. The imputed value of materials acquired without costs, and the value of unpaid labor, could be estimated roughly for other types of construction, but inclusion is considered undesirable because the expenditure series is defined to represent only cash outlays.

6/ Farm Housing and Construction, U. S. Department of Agriculture, Bureau of Agricultural Economics, February 1952, tables 19-21, contains estimates of the volume and imputed value of farm produced and salvaged lumber used in farm construction, and an imputed value for nonpaid labor used for construction purposes. (See especially table 1, footnote 9.)

7/ An expenditure series for oil and gas well drilling is published annually by the Department of Commerce (Statistical Supplement, p. 75). This series has been treated independently because it has not been considered conceptually comparable to the activities in the current construction expenditures series. However, it was considered a bona fide construction activity in the Sixteenth Census of the United States, Census of Business, Construction, 1939, Vol. IV, p. VIII. For comparative purposes the inputs to this activity can be eliminated from the interindustry construction analysis and treated independently.

[illegible] (Table 1).

[illegible]

1/ [illegible]

2/ [illegible]

3/ [illegible]

4/ [illegible]

facilities, and rural electrification cooperatives. 8/ These activities have been included because they conform with the definitions and clearly lie within the conceptual framework of construction activity as an integral segment of an interindustry chart. These and other differences from the current series are discussed in Chapter III of this report.

Chapter II Collection of Expenditure Data

Two major interrelated challenges have confronted the construction statistics analyst from the beginning of the compilation of construction expenditure data. Although a definition can be fairly succinct as outlined in the previous chapter, the mere cataloging of the structures and facilities is no assurance that the final product will be a precise measure of all construction expenditures. For a number of construction categories there are such severe limitations in the current sources and methods of data collection as to preclude any precise estimate of the accuracy of the level of expenditures, or even any confident statement about completeness of scope and coverage in data collection for some types of construction.

Except for the data on new residential units and residential additions and alterations (which are based primarily on building permit reports obtained by the Bureau's Division of Construction Statistics) the information received by both agencies responsible for the expenditure series is collected and, in many instances, processed and compiled by other government agencies, trade associations, and private companies. The information used to estimate the new activity levels is obtained from approximately 30 different sources. 9/ Hence, the procedure for estimating the value of new construction varies considerably among types, and is determined largely by the nature of the source data. The information on construction expenditures obtained from certain government sources is accepted with little or no further adjustment, e.g., Bureau of Public Roads, Tennessee Valley Authority, and other Federal agencies. However, in the majority of cases, adjustment of the data is necessary in order to make the end product as homogeneous as possible. These adjustments consist of eliminating nonconstruction items, accounting for undercoverage and understatement, and converting contract award data to work-in-place, etc. The accuracy of this adjustment process varies considerably depending upon

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8/ These categories of construction activity are excluded from the current Commerce-Labor estimates primarily because insufficient data are available to set up an annual or monthly time series.

9/ The sources used in estimating expenditures for new construction, by ownership and type of construction, are presented in Expenditures for New Construction, pp. 20-21, and Statistical Supplement, p. 76.

the detail made available in the original sources. 10/

There are fewer and far less reliable sources from which to estimate maintenance and repair construction expenditures. Because of the frequency of occurrence and the inconspicuousness 11/ of this type of activity, it is most difficult to cover. Although these expenses are usually included with other current operating costs, there is no necessity for maintaining any special account for this type of expenditure. Except for data from some of the public utilities, Corps of Engineers' river and harbor work, and Bureau of Public Roads' estimates of highways, roads, and streets, the source data upon which the current maintenance and repair construction activity expenditures are based are not at all of the quality of data from those sources upon which the new construction activity levels are based.

It is not the primary purpose of the public and private groups concerned in collecting construction expenditure data on the various industries to supply the Departments of Commerce and Labor with information these agencies deem necessary for the production of a highly accurate series of construction expenditures. 12/ These organizations are not usually interested in fine conceptual distinctions between construction and equipment as defined by the Departments of Commerce and Labor. In many instances, an attempt to make this differentiation would rapidly reach a point of diminishing returns with respect to the major purposes of the collection of expenditure data. This point is reached early when the cost of collecting and processing data is a primary consideration. Hence, little attempt is made to observe a sharp distinction. In those few instances where finances are not the limiting factor, the task of classification is usually too burdensome and time-consuming in relation to the interests of the collecting agency.

10/ The techniques for deriving "value-in-place" estimates are discussed in Expenditures for New Construction, pp. 21-28, and in Statistical Supplement, pp. 77-83.

11/ As evidenced by the fact that local requirements as to building permits cover only a small portion of maintenance and repair expenditures.

12/The Commerce-Labor concept of construction is strictly adhered to only in the collection of nonfarm residential permit valuation data for new dwelling units and additions and alterations by the Bureau of Labor Statistics, and expenditures on farm buildings by the Bureau of Agricultural Economics. Other Federal agencies directly engaged in construction activity, e.g., Bureau of Reclamation and TVA, follow these definitions to a greater or lesser degree, and in many respects the uniform system of accounts prescribed by the Interstate Commerce Commission, Federal Power Commission, and Federal Communications Commission conform closely to the Commerce-Labor concepts of construction.

These limitations in the raw materials upon which the statistics are based have been generally recognized. The existence of a fair margin of error in the expenditure levels for a number of types of construction has never been denied. 13/ It is not possible to determine the absolute margin of error for most series because there is no scientifically designed sample which would permit a statistical estimate of error, and there is no firm benchmark from which any check can be made. However, because there has been no significant change in data collection methods and sources 14/ in the past decade, and no significant change in the techniques and assumptions upon which the construction value-in-place figures have been based, it may be reasonably assumed that the trends indicated by the figures within a series are valid, and that the error in percentage changes in expenditures for any particular type of construction is relatively less than the error in level.

For many analytical purposes, this indication of trend is satisfactory though an absolute error of 5 percent or more may exist. However, for interindustry analysis purposes in which detail is important, a 5 percent error assumes considerably greater significance. An error of understatement of 1 percent in the total level of expenditures in 1947 accounts for a quarter billion dollars in material and nonmaterial purchases. 15/

The second dilemma facing the analyst is the determination of the content of the basic data. Standard definitions of construction and equipment serve only a limited function in this field because primary responsibility rests almost entirely upon uncontrolled collecting organizations. If all materials consumed in the erection of a complete operating facility were to be classified as between construction and equipment, there still is no guaranty that provision of a uniform classification system by Commerce-Labor would lead to consistent results in the collection of the basic data. Depending upon the source of data -- owner, architect, engineer, or construction contractor -- there will be a variation in the reporting of construction costs. Hence, except for the regulated industries, Federal construction activity, and highway, road, and street construction, it is difficult, if not impossible, to determine what has

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13/Chapter III of this report contains a detailed discussion of some categories of construction activity which have been revised from current Commerce-Labor levels. Such matters as techniques, sources, and assumptions are reviewed in detail.

14/This does not refer to the introduction of a new series, drastic revisions in an existing series owing to change in concept, or the adoption of new estimating technique.

15/"Any bias inherent in the data is likely to be fairly constant from year to year. The estimates are more likely to be an understatement of the absolute level than an overstatement." Statistical Supplement, p. 83.

been considered construction by the unit which collected the expenditure data. 16/ It is doubtful whether any substantial progress toward uniformity will be achieved in the foreseeable future.

The preceding discussion highlighted some of the major problems faced in the interindustry analyses of the construction industry. With the necessity for balancing production and consumption in the economy and the requirement for operating within the limits of standard government concepts of construction 17/ and producers' durable equipment, what may appear to be a minor imperfection in the present series can assume greater seriousness. There is no doubt that the current Commerce-Labor construction activity expenditure series is about as good as can be derived from the data and funds presently available. New and better sources are constantly being sought and investigated by Commerce-Labor in those areas considered weak. However, for the interindustry analysis it was necessary to fill in the gaps and make quick decisions wherever data needed amplification. Consequently, certain revisions were made in the existing series in a less exacting fashion to extend the scope and coverage of construction statistics.

Chapter III Revisions of the Current Commerce-Labor Level of Construction Expenditures, 1947

A. General Approach

It was pointed out in the previous chapter that the current Commerce-Labor level of construction expenditures was understated. There were indications of the possible areas of understatement and complete omission, but no estimate of the total volume was indicated. In the early phases of the construction analysis, a number of control totals for the level of construction activity were changed as special circumstances required (table 2, column 2). Most of these changes were minor and resulted from the more detailed analysis of a particular industry by the industry analyst, e.g., pipe line maintenance, local transit, and railroads.

16/For a turnkey construction job, costs of carpets, venetian blinds, shades, and even office furniture have been included in some of the reported construction contracts.

17/The National Income Division, U. S. Department of Commerce, uses the Commerce-Labor estimates of construction activity and accepts their conceptual definitions.

The only changes worth mentioning in the "first order" revisions are those for farm construction and oil and gas well drilling. In the former instance, an entirely new category, Land Betterment (table 2, lines 16 and 43) was added to the series. In the case of oil and gas well drilling expenditures, a considerable volume of information was secured from oil and gas well drilling contractors, and from integrated petroleum companies. Although this information was originally requested in order to provide a distribution of materials consumed, it was found that the data provided the basis for an independent estimate of drilling expenditures roughly 40 percent higher than the published figures for 1947.

Although other serious questions arose from time to time as to the adequacy of specific construction figures, no additional changes in the construction activity control totals were made until the final reconciliation stage when the sectors of the interindustry relations chart were being balanced with one another. At this last stage it was possible to summarize and appraise all allocations from each producing sector to consuming sectors. Thus, all materials and services of the type that could go to some kind of construction were tabulated. For the sectors producing these items, listings were made of allocations to construction within the framework of the official series (including the "first order" revisions), for other industrial purposes, for government consumption, for export, etc. At this stage, many items normally considered as construction materials were left unallocated.

A critical review of all allocations was then made and in many cases the allocations for nonconstruction uses were increased. The result was an aggregate amount of approximately $2.2 billion of construction type materials not reconcilable to the control totals for construction activity. The inference was that a correspondingly large aggregate of construction expenditures was missing from the official series, because of unrecognized omissions in collection of data or unsatisfactory estimating procedures, or a mixture of both.

At this stage, a final appraisal was made of each construction control total. In many areas there was reason to question the level of activity indicated for 1947. In some cases, there were alternative data, e.g., Census of Manufactures data for industrial construction in 1947; in other cases, the blow-up procedures seemed biased in a downward direction, or there were obvious gaps in the scope of the statistics. Where this appraisal indicated the necessity for revisions, independent estimates were made on the basis of the best data or judgments available within the limited time allowed for this operation. These revised control totals have some numerical foundation even if they cannot be defended by specification of sound statistical estimating procedures.

The final control totals established for new and maintenance construction are not dependent upon the original computation of the value of unallocated materials. The revisions incorporated into the current Commerce-Labor series are considered conservative and still not sufficient

to account for all understatement in the construction series. There are still sufficient material and nonmaterial items available to account for a significant amount of construction if some reasonable basis of estimation could be developed.

B. Revisions and Additions

Thirty-one additions and revisions were made in the current series, increasing the aggregate level of construction expenditures from $24.8 to $28.7 billion. This section presents a review of these revisions and additions, specific estimating procedures, and a comparison of the final results with the current Commerce-Labor levels. They are discussed in the order presented in table 2. (The footnotes to table 2 present short reviews of sources and techniques.)

1. New Construction

a. Residential

(1) Residential Additions and Alterations (Table B-2, Line 5)

The revised estimates of expenditures for additions and alterations were made in conjunction with those for residential maintenance and repair. A detailed discussion of the sources, methodology, and assumptions involved in revising the current estimate of $735 million to $1,183 million is presented in Appendix A, p 33.

(2) Nonbuilding Residential Improvements (Table B-2, Line 7)

Certain types of expenditures made in the general field of residential construction have been omitted from the current activity series. These are expenditures for nonbuilding items, such as fencing, driveways, walks, and patios, usually incurred after the completion of the building. Assuming that this type of construction was kept to a minimum during the war years, 1947 should have witnessed an unusually large volume of this type of activity. The estimate of $50 million incorporated into the revisions is equivalent to an expenditure of $150 per residence for a third of a million residences or $100 for half a million residences. Additional research might indicate a higher figure for this widespread activity.

b. Private Nonfarm Nonresidential Building, New (Table B-2, Line 8)

The current expenditure series for private nonresidential building is based upon the F. W. Dodge contract awards for the 37 Eastern States. These awards are adjusted to account for: (1) the excluded 11 Western States; (2) undercoverage; (3) understatement of award valuation; (4) architectural and engineering fees (which may run as high as 5 percent

of total cost); and (5) the relatively large volume of force account construction for additions, alterations, improvements, and minor new buildings. The revised aggregate totals are lagged according to various construction timing patterns and a value-in-place series is derived. 18/

The adjustment for the 11 Western States is based upon Report of Building Permits, BLS, from which ratios for urban-nonresidential permits issued are computed monthly between the 11 Western States and the remainder of the country. For any specific type of construction this ratio varies from month to month, ordinarily within a small range. For the remaining four categories, however, a constant upward adjustment is applied, 25 percent for industrial construction and 15 percent for all other nonresidential building construction. The latter two adjustment factors are believed to have been quite conservative for the immediate postwar construction boom period. This resulted in an understatement of actual levels of activity in 1947 as indicated in the following analyses.

(1) Industrial Construction, Private (Table B-2, Line 9)

Expenditures for private industrial construction 19/ for 1947 are estimated in the current Commerce-Labor series at $1,702 million. However, the 1947 Census of Manufactures reported total construction expenditures on manufacturing plants owned by reporting manufacturers as $2,122 million. 20/ Furthermore, the Census figure understates actual total outlays for manufacturing plants to the extent of expenditures on plant not in production in 1947 and expenditures by nonoperating owners of manufacturing facilities. On the basis of this Census data, and by estimating expenditures on new plant beyond the scope of the Census survey at $200 million, the total value-in-place expenditures for private industrial building construction was increased for the interindustry study to $2,322

18/For detailed explanation see Expenditures for New Construction, pp. 23-24, or Statistical Supplement, pp. 78-80.

19/The F. W. Dodge contract award series classifies all above surface structures constructed on mining property as industrial construction.

20/Census of Manufactures construction expenditures were limited to the following: If construction of a new plant was started prior to 1947 and completed in 1947, only the cost of that portion erected in 1947 would have been reported; if construction was started during or prior to 1947, and scheduled for completion in a later year in an establishment where manufacturing operations were conducted in 1947, only the cost of that portion erected in 1947 would have been reported; if construction was started during or prior to 1947, and scheduled for completion in a later year with no production in 1947, the construction expenditures would not appear in the Census figures. The figures do not include construction expenditures made by the owners of plants leased to reporting manufacturers, unless the owner was also a manufacturer.

million. 21/ Because data were not available no adjustment was made for those above surface structures erected on mining property which by definition were excluded from Census of Manufactures data, e.g., grading, washing, screening, concentrating and roads.

Whereas the current Commerce-Labor estimate, based upon F. W. Dodge Corp. contract awards, includes expenditures for new structures, including additions and alterations, the interindustry estimate based upon Census of Manufactures' data includes expenditures for all capitalized plant including improvements and possibly major repairs for which depreciation accounts are set up. 22/ This latter figure presents a more accurate total of charges to Gross Private Capital Formation. In estimating the charges to the manufacturing sectors for maintenance and repair expenditures, independent estimates were computed, based upon Bureau of Internal Revenue data. Because these returns are oriented to accounting principles, the estimates would exclude any expenditures for capitalized repair work included with new construction. However, the aggregate interindustry control total for maintenance and repair was tied to the official Commerce level for nonresidential building which does not include improvements but covers all repairs, capitalized or not. The work done in the interindustry analysis of construction tends to indicate that the current level is understated.

(2) Commercial Construction, Private (Table B-2, Line 10)

Although data comparable to a Census of Manufactures are not available for this type of construction, there is reason to believe that the current estimate of $856 million is low. A considerable backlog of demand for addition and alteration work set up during the war period was met for this type of construction in 1947. A large amount was believed to be on low cost projects below the F. W. Dodge cutoff point 23/, jobs requiring less than the prerequisite number of special trades required

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21/ In the publication Annual Survey of Manufactures: 1949 and 1950, U. S. Department of Commerce, Bureau of the Census, Industry Division, 1952, Chapter IV, "Expenditures for Plant and Equipment", p. 112, expenditures for new structures and additions to plant for 1949 and 1950 are respectively 61 and 33 percent above the current comparable Commerce-Labor estimates.

22/ The section Expenditures for Plant and Equipment in the schedule of the 1947 Census of Manufactures allows some leeway in interpretation of the items. Although costs incurred for maintenance and repair were to be excluded, expenditures chargeable to property account for fixed assets were to be included. Hence the possibility exists that major repairs charged to capital account may have been included in some cases.

23/ The F. W. Dodge cutoff point varies among the types of construction and depends upon the state of construction activity within an area, and upon the requests of its subscribers. As far as can be determined, there is no inflexible ruling covering all cases for all periods.

for inclusion in Dodge reports 24/, and jobs in which the owner or lessee acted as his own general contractor and entered into agreements directly with special trades contractors without any public announcement. 25/ Hence, the 15 percent upward adjustment to cover architect and engineering fees, force account construction, and undercoverage and understatement was considered low for 1947. An additional 25 percent upward adjustment was applied to the existing estimate, raising total commercial construction for 1947 for the interindustry analysis to $1.071 million.

(3) All Other Nonresidential Building, Private (Table B-2, Line 12)

This category includes religious, social, recreational, and miscellaneous nonresidential buildings. Although an adjustment of 15 percent was made in the interindustry study to the first two subgroups, increasing expenditures from $225 to $258 million, 26/ the important revision in this segment refers to the adjustment of the "miscellaneous nonresidential" category, which was increased from $75 million to $377 million.

The current estimate of $75 million is based upon the F. W. Dodge contract award series subclassification "miscellaneous nonresidential building". Included in this category are such structures as animal hospitals, pounds, private garages, greenhouses, refreshment road stands, and boathouses, with average costs considerably under the F. W. Dodge cutoff point. Some of these are jobs in which F. W. Dodge subscribers are not interested, and very seldom do F. W. Dodge sources of data have any contact with these. Using Report of Building Permits Issued, it was possible to check the expenditure levels for certain types of buildings included in this classification.

(a) Private Garages: In 1947, permits with a valuation of $78 million were issued in urban areas for the construction of individual private garages. In 1946, the figure was $58 million. These

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24/ Theoretically, all projects requiring two or more special trade skills are covered. In actual practice, however, it is believed that this is not always the case.

25/ Leasehold improvements by renters provide a substantial annual expenditure, and there is a strong possibility that Dodge misses many of these small but numerous projects because its sources of information are limited and the projects are beyond their scope of coverage. Service station chains frequently supply all their business to a single local company, bypassing the usual contract awarding procedure in which F. W. Dodge is interested.

26/ From discussion with other technicians, it was assumed that the element of undercoverage did not exclude these two subgroups. However, with the bulk of this type of building limited to rural nonfarm and urban areas, the adjustment was limited to 15 percent.

permit valuations do not include the value of garages included in any permit issued for residential structures; hence the BLS-404 permit valuation does not include any duplication of permits issued for garages. Most of these structures are erected in a comparatively short time, and it can be estimated safely that about $70 million in garages for which permits were issued were erected in 1947.

However, adjustment must be made for understatement and undercoverage. An increase of at least 25 percent had to be made for understatement. This was the estimate used for new residential construction in 1947. An estimate of 50 percent for both understatement and undercoverage results in an expenditure of $105 million for the actual level of private residential garages built in urban areas. Although the opinion has been expressed that aggregate construction for garages in rural nonfarm areas is higher than in urban areas, it was decided to assume an equal distribution of expenditures. Total expenditures for private nonfarm garages therefore were estimated at $210 million in 1947.

(b) Sheds, Poultry Houses, Stables, Barns, etc.: The BLS-404 reported permits issued in urban areas for this type of structure amounted to $15 million in 1947 and $12 million in 1946. It was estimated that $14 million of these structures for which permits were issued were erected in 1947. Understatement and undercoverage would be much greater in this category than for garages. An allowance for twice as much would give an expenditure of $28 million for urban areas. This type of construction is probably greater in rural nonfarm areas, but the assumption of equal volume results in total nonfarm expenditures of $56 million.

(c) All Other Nonresidential, n.e.c.: Permits for this catch-all category totaled $20 million in 1947 and $17 million in 1946, and it was estimated that $18.5 million was put-in-place in 1947. It was assumed that the "blowup" to correct for understatement and undercoverage for this group in urban areas should be the same as for sheds, 100 percent, and that rural nonfarm volume was the same as urban volume; hence, total expenditures were estimated at $74 million.

(d) Summary: Aggregate expenditures for the structures discussed in (a), (b), and (c) amounted to $340 million. It is doubtful whether an appreciable amount would have been picked up by F. W. Dodge. However, assuming that half the Dodge base from which the current $75 million was derived included expenditures for these structures, a deduction of $38 million should be made from the $340 million. This remainder, $302 million, represents expenditures excluded from the current "miscellaneous nonresidential building" category.

c. Farm Construction (Table B-2, Lines 13-16)

A detailed discussion of the revisions to the farm construction activity levels is presented in Appendix A, p.36.

d. Public Utility

(1) Railroad Construction (Table B-2, Line 18)

New construction activity was reduced from $318 million to $287 million as a result of the detailed railroad industry analysis. This difference of $31 million was due to inclusion of expenditures for land, road and shop machinery, and power plant machinery in the current level.

It should be noted that railroad accounts are maintained in such fashion that a number of overhead costs for force account construction, (such as depreciation and office expenses), are included in accounts other than construction. Hence, railroad construction activity (new, and maintenance and repair) is understated to the extent of these omissions.

e. Sewer and Water

(1) Water Supply (Table B-2, Line 28)

The current level of expenditure was raised from $195 million to $226 million. This upward revision was based upon the opinion of technicians that insufficient weight had been given the volume of new force account construction, and the considerable purchase of construction materials directly by the municipalities.

f. Highways, Roads, and Streets (Table B-2, Line 29)

Land and right-of-way costs were erroneously included in the 1947 expenditure series. Hence, the $29 million reduction from $1,514 million to $1,485 million for these items does not represent any change in the actual volume of construction, but merely eliminates nonconstruction expenditure.

g. Oil and Gas Well Drilling (Table B-2, Line 33)

The revised estimate of $1,076 million is based upon an actual survey of contractor drilling costs for 1947 and cost data submitted by petroleum companies on costs other than payments to drilling contractors.

Although this activity is not an integral segment of the Commerce-Labor series, construction expenditures have been published by the Department of Commerce. The 1947 estimate of $773 million was derived by projecting expenditure data shown in the 1939 Census of Crude Petroleum and Natural Gas. A significant cause for the difference was the inability to make adjustments for technological changes, variations in type of drilling (rotary vs. cable), changes in labor and work practices, areas of drilling, etc.

2. Maintenance and Repair Construction

a. Building

(1) Residential

(a) Expenditures by Home Owners and Owners of Rented Residential Units (Table B-2, Line 37): The current estimate of expenditures for maintenance and repair by home owners and owners of rented property is $2.2 billion, distributed approximately as $1.4 billion and $0.8 billion, respectively. This is admittedly one of the weaker estimates in the construction expenditure series, and information from the Federal Reserve Board, Federal Housing Administration, and other sources indicates that the current level is substantially understated. The derivation of the $3.3 billion estimate used for the interindustry analysis is explained in detail in Appendix A, p.33.

(b) Expenditures by Tenants on Rented Units (Table B-2, Line 38): Historically, the Commerce residential maintenance and repair expenditure series includes only expenditures by home owners in owner-occupied homes and by owners of tenant-occupied units. During and since World War II, the volume of maintenance and repair construction financed by tenants of rented units increased considerably over the prewar period. In mid-1947, there were approximately 15.4 million nonfarm tenant-occupied units in the United States. According to a Bureau of Labor Statistics survey of consumer expenditures for 1947, tenants in specified cities spent from an average of a few dollars to close to a hundred dollars on construction maintenance of their dwelling units. An estimate of $10 per unit resulted in a total expenditure of $154 million by renters.

b. Public Utility

(1) Railroad Construction (Table B-2, Line 45)

The increase in this category was due to the detailed analysis of the industry made for the entire railroad industry. The increase was due primarily to additional charges for salvage which should have been added to construction, and adjustments made in the operating expense accounts for deferred maintenance.

(2) Local Transit (Table B-2, Line 46)

The current estimate of $46 million represents expenditures on privately owned local transit systems. Publicly owned local transit systems are included in the current series with miscellaneous public service enterprises, but prior to the interindustry analysis no estimate had been made for maintenance and repair in this category. However, the analysis of the local transit industry indicated a total expenditure of $70 million for maintenance of both public and private systems. Because local

transit is treated as an independent unit, the $24 million expenditure on publicly owned systems was added to the private segment of this category instead of to miscellaneous public service enterprises.

(3) Electric Light and Power (Table B-2, Line 48)

Maintenance expenditures on Rural Electrification Administration projects are currently excluded from the expenditure series. With aggregate new expenditures in the vicinity of a billion dollars, maintenance and repair expenditures were set at $10 million. This represents a token estimate and is probably too low.

c. Conservation and Development (Table B-2, Lines 56-60)

(1) Federal, except Parks and Playgrounds

Federal maintenance and repair expenditures for conservation and development will be treated in two sections: Corps of Engineers, and all other Federal (such as T.V.A., Bureau of Reclamation, and Bonneville).

Although sources are available from which maintenance and repair expenditures could be obtained for the latter category, the cost of using these sources would be prohibitive. However, a review of releases by T.V.A. and the Bureau of Reclamation indicates that maintenance and repair construction expenditures for these types of construction are comparatively low, probably about 1 percent of value-in-place. Between 1915 and 1946, new construction by the Federal agencies in this category amounted to approximately $3.7 billion. Construction maintenance and repair expenditures were estimated at $40 million.

Expenditures for construction maintenance and repair by the Corps of Engineers were treated in two parts: river and harbor, and flood control. The $95 million expenditure in the current series represents expenditures for only river and harbor work. No direct information can be obtained on the volume of maintenance and repair for flood control, although approximately 40 percent of total new construction by the Corps of Engineers was for dikes, levees, revetments, etc. However, from August 1941 through fiscal 1948 (June 1949), the Corps of Engineers spent approximately $92 million for emergency flood control repairs. It was estimated that $15 million was expended in 1947.

Total direct Federal expenditures for all construction maintenance and repair for conservation and development was estimated to be $150 million, an increase of $55 million over the current $95 million estimate.

(2) Non-Federal Public Conservation and Development (Table B-2, Line 61)

This category includes expenditures by State and local government comparable to those made in Federal conservation and development,

e.g. flood control, water conservation, and drainage. There are two distinct types of expenditures made in this activity: expenditures by local governments on projects constructed by the Federal Government and turned over to the locality for maintenance, and expenditures on projects constructed by local authorities.

Expenditures for normal maintenance and repair of federally constructed flood control projects are usually the responsibility of the local government. No data are available on the volume within the jurisdiction of the local governments, but a token estimate of $25 million was adopted for this study.

Although a series could be prepared fairly easily, there is currently no data on total new construction for non-Federal conservation and development which would provide a benchmark for maintenance expenditures. The longest period for which any data on this type of new construction are available is the F.E.R.A.-C.W.A.-W.P.A.-P.W.A. era from 1934 through 1942 during which more than $1 billion was spent for this type of activity. Any estimate would be an educated guess, and a round figure of $50 million was chosen.

(3) Parks and Playgrounds (Table B-2, Line 62)

Currently, there is no series indicating new expenditures for parks and playgrounds and hence no benchmark for an estimate of maintenance and repair. The $10 million estimate in this study is purely judgment.

d. Military and Naval (Table B-2, Line 63)

Expenditures for military and naval maintenance and repair construction are currently not included in the Commerce series. Between 1915 and 1940 approximately $4.9 billion in new facilities were erected and another $11 billion from 1941 through 1946. No expenditure figures are published for construction maintenance and repair of military and naval facilities. However, the Department of Defense did issue a combined operations and maintenance expenditure figure for 1947. From an analysis of these operating costs, and on the basis of discussion with technicians involved in collecting these statistics, the volume of maintenance and repair work was estimated at $175 million.

e. Miscellaneous Public Service Enterprises (Table B-2, Line 64)

From 1915 through 1946, total new construction for this category was approximately $3 billion. Except for water supply and sewage disposal, all publicly owned utilities are included in this category in the current series. From an analysis of the composition of this type of construction in Construction Activity in the United States, 1915-37, it was possible to estimate a distribution of the $3 billion into some of its components. Local transit, included elsewhere in the interindustry study, accounted for roughly 40 percent of the expenditures. The assumption of a maintenance and repair bill of about 3 percent on the remaining portion gives an expenditure of approximately $50 million.

C. Other Areas of Omission and Possible Understatement

Despite the upward revisions to current Commerce-Labor control totals and the inclusion of activities omitted from that expenditure series, there are additional areas of undercoverage and understatement. For various reasons no attempt was made to derive estimates of expenditures for these areas.

One important segment currently omitted from the I-O series are expenditures by residential developers and builders for roads and streets constructed and paid for by the builder. These costs do not appear as part of the land development cost adjustment made in nonfarm residential construction nor are they included in the building permit valuation filed and eventually used by the Division of Construction Statistics, BLS, to determine value-in-place expenditures. They are omitted also from highway expenditures because they are paid for privately. There is no doubt that the volume of these expenditures varies considerably from year to year but the consensus is that these costs are substantial, particularly since 1946.

Another activity currently excluded is also directly related to residential construction. Seasonal dwelling units failing to comply with certain specifications do not appear anywhere in the series. Instructions to BLS field agents specify that summer cottages may be classified as dwelling units if all of the following requirements are met:

1. Each contains built-in cooking facilities;
2. Each contains built-in heating facilities (where required for year round living);
3. Each contains a private bath or has access to semiprivate bath facilities; and
4. It is the intention of the owner or builder to use or rent each unit as a semipermanent family dwelling.

A considerable number of units erected in resort areas do not meet these qualifications and are omitted from the BLS data. The number and value of these units are unknown and no effort was made to estimate either. A related type of activity but much smaller in volume is the construction of barracks at lumber camps, in farm areas (but not on farms) for migratory workers, in resort areas, etc. Although of minor importance in the residential category, it is mentioned with the other omitted activities.

At the time the analysis of expenditures for private industrial construction was made, it was not realized that the Commerce-Labor figure of $1,702 million included expenditures for above-surface mining structures. The revision to this estimate was made in terms of expenditures in the Census of Manufactures, 1947, which obviously excluded the mining and

quarrying industries. 27/ (See page 20.) Hence, the final expenditure figure of $2,322 million used in the interindustry analysis for industrial construction is exclusive of the construction of any above-surface mining structures (e.g. buildings, fencing, and track). The volume of this type of construction could not be segregated from the F. W. Dodge Corp. contract awards in its "manufacturing buildings" classification and no attempt was made to estimate the volume of expenditures. Cemetery construction is another activity for which no allowance has been made. Conceptually, the buildings erected are included in the religious category, but work done on the grounds (e.g. grading, drainage, fencing, and roads) does not appear in any activity series.

Finally, there is an area of omission, or understatement, which lies in the twilight zone between construction and producers' durable equipment, and is difficult to define. This situation stems in part from the definition of construction, from the collection of expenditure data, and from the treatment of producers' durable equipment by the owner. Conceptually, structural foundations built specifically for production or any other type of equipment are considered to be construction. Usually the foundation is prepared to the extent needed for the machine to be set in, bolted, and connected. However, the installation of equipment, especially in existing structures, frequently entails additional work either on the part of the owner or of the outside company installing the equipment. This would include additional lines for water, steam, compressed air, gas, drainage, electric power, or whatever is needed. In some cases this work is fairly extensive, and occasionally it is necessary to enlarge openings, or install more partitions to allow the installation. Often the entire cost of the equipment and incidental construction-type expenses will be carried in the accounts of the owner as capital equipment cost. However, in order to coincide with the definition of construction, the cost of such equipment has to be maintained separately from construction installation costs. It is doubtful whether these quasi-construction expenses appear in the official construction expenditure series. In any event they appear conceptually, if not statistically, in the gross private capital formation sector.

Although upward revisions were made to a number of levels of activity, there are still some areas of undercoverage for which no adjustment was made in this analysis - new nonfarm residential dwelling units, and nonresidential building maintenance and repair. In deriving expenditures for new nonfarm residential construction for 1947, the Division of Construction Statistics, BLS, adjusted for undervaluation of building permits, and for the noninclusion of architectural and engineering

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27/ The Census of Manufactures data excluded construction for mining proper (such as grading, screening, washing, concentrating, and roads) but includes manufacturing plants (such as for smelting) located at the mines.

fees and land development costs. No account was taken of any underreporting, though there was reason to believe that enforcement was lax in a considerable number of rural nonfarm permit issuing areas and probably in a smaller but appreciable number of urban places also. Total value of the unreported segment in this area may have run about 5 percent of total new expenditures. However, no revision of the current estimates is currently contemplated (Appendix A, p. 38).

The belief that nonresidential building maintenance and repair expenditures are understated is reinforced by consideration of probable maintenance requirements of existing buildings. Expenditures for maintenance and repair are best judged in terms of relative costs during a base year (1939 in this instance). This procedure is deemed advisable for estimating current year costs in order to minimize the effect of price changes which might tend to distort the proportion of maintenance expenditures to original cost. Total expenditures for new private and public nonfarm nonresidential building construction from 1915 to 1947 (in terms of 1939 dollars) amounted to approximately $59.3 billion. 28/ Taking account of construction prior to 1915 and allowing for demolition, fires, etc., it would be conservative to estimate that the 1947 value for the buildings standing (in terms of 1939 construction costs) would be approximately $75 billion. Expenditures for maintenance and repair in 1947 at current prices were estimated at $1.6 billion (table 2, line 39). In terms of 1939 prices this would be about $850 to $900 million or equal to 1.13 to 1.20 percent of the total new value of buildings standing. A 1.2 percent estimate for maintenance and repair is conservative from other points of view. It should be noted that in 1947 each 0.1 percent is equivalent to approximately $130 million.

A further complication in the revision of the current estimates involved expenditures for major improvements. From an accounting standpoint, as reported to the Bureau of Internal Revenue, major improvements are considered as capital expenditures, with corresponding depreciation reserve accounts. Hence, for purposes of conceptual inclusion in an interindustry chart, these expenditures should be included in the new construction segment. However, the sources from which the major portion of the construction expenditure series are currently derived not only preclude this accounting-type of classification, but raise additional questions concerning the accuracy of the estimates of the levels of activity.

In the current series new construction is conceptually limited to the erection of new structures and to structural (defined loosely) additions and alterations. Improvements do not necessarily comply with either definition. Furthermore, whereas building permits are usually required for the former, few, if any, are required for improvements. Hence, this important construction item has been omitted from residential construction, and it is doubtful whether the F. W. Dodge contract award series for nonresidential building included a substantial amount of this type of construction. Improvement type construction is outside the range of their primary interest, is considered a periphery item, and is difficult to obtain from their primary sources of data.

28/ Statistical Supplement, p. 6 (total private nonresidential) and p. 10 (total public nonresidential).

In the interindustry study, improvements have been included in both new and maintenance construction. This led to an understatement in the new construction sector, and hence in the gross private capital information sector as well. The source from which the basic data for nonfarm residential maintenance and repair expenditures were obtained precluded the possibility of deriving separate estimates for improvements and for true maintenance and repair outlay. (See Appendix A.) In the residential sector, therefore, a substantial amount of new improvement construction is included with maintenance. In new industrial construction, however, expenditures for improvements are included in the revised interindustry estimates. The source used for the revision of the current Commerce-Labor level of expenditures, the Census of Manufactures, included improvements in its estimates of outlays for new plant.

The upward adjustment in the remaining nonresidential building categories was primarily intended to cover the understatement and undercoverage for new construction, including additions and alterations, within the scope of the current expenditure series. There is no method of determining whether these adjustments were of sufficient magnitude to have included expenditures for all improvements. No data were available indicating the volume of improvements or capitalized repair projects for these types of nonresidential buildings, and there was no attempt to estimate expenditures. However, except for that portion included in the nonfarm residential maintenance and repair estimate, improvement expenditures are included in new construction and carried in the chart as capital outlay.

D. Levels of Unallocated Inputs

It was mentioned earlier in this section that after the "first order" revisions had been incorporated into the expenditure levels, an irreducible minimum of $2.2 billion of new construction-type materials could not be fitted into the control totals. (Allocations of materials to construction has been in terms of new materials.) The final revision of construction expenditures (table 2, column 5) was approximately $3.1 billion above the "first order" revision, but it was still of insufficient magnitude to fully absorb the $2.2 billion material residual, because of the volume of nonmaterial costs. In the final analysis, approximately $150 million in new materials could not be absorbed in the revised I-O construction control total, and was reallocated elsewhere in the output of the industries. It would have been a fairly easy operation to absorb this residual, and materials previously rejected, through reduction of aggregate nonmaterial costs. This procedure, however, would have resulted in a further unbalancing of the nonmaterial proportion to total which already had been sharply reduced.

In the original allocation of material and nonmaterial costs, the primary objective was to absorb the material allocations. As a result of this policy, expenditures for nonmaterial costs were deliberately

reduced below the absolute minimum necessary to cover the expenses generated in installation of materials. The data available for distribution of nonmaterial costs to consuming segments was less reliable than that for materials. Hence, although it was obvious that additional nonmaterial costs should have been accepted or allocated to the construction industry, these allocations were either rejected or reduced because the control total for construction expenditures had already been determined. Additional acceptance of these nonmaterial costs would mean an upward adjustment of the control totals. Allocations which were reduced included architectural and engineering fees, equipment charges, travel expenses, and labor costs. Items completely omitted included office materials and supplies, contributions, legal services, club and association dues, books and magazines, gifts, and similar items. It is difficult to estimate the volume of these nonmaterial costs currently excluded or definitely known to be understated.

Another element to be considered is that of used materials. Estimates from informed sources have placed the value of used building materials purchased for construction at 2.5 to 5.0 percent of the value of new building materials. 29/ Although this range seems high under ordinary conditions, an estimate of $250 million does not appear to be excessive for 1947, when shortages of many kinds of new materials hindered orderly progress on many jobs throughout the country. Sources indicating the use and supply of specific used building materials are almost nonexistent. The Census of Business included the sales of used building materials by building supply dealers whose major source of income was derived from sales of new building materials. However, the approximately $6 million involved in this segment represents a small fraction of the estimates for the industry. Demolition contractors are the principal source of supply for used materials and the activities of these contractors were not included in the Census of Business. Other important sources consist of dealers who buy used materials from contractors, railroads, and others; and in the largest cities there is an appreciable sale by dealers who buy in job lots from demolition contractors.

The gross distribution of building supplies was based upon production (shipments) and inventory change. Used materials not entering trade had not been included in the total allocated to consuming industries. Only the sum total of new materials was available for distribution in the construction industry. The net effect, therefore, was upon the level of inventory of new materials because construction expenditures include costs for both new and used materials. This situation did not affect the interindustry analysis for construction because the primary purpose was to determine the total input requirements for specific materials. If necessary, estimates could be made for the quantity of used materials consumed.

29/ During periods of material shortages, used building materials present a significant source of supply, and the immediate postwar period of shortages extended throughout 1947 for many types of building materials.

Despite the substantial additions made to the current Commerce-Labor levels of construction expenditures, the final aggregate total of $28.7 billion may still be considerably understated from the point of view of the interindustry chart. The combination of conservatism in revising some of the existing Commerce-Labor levels, and complete omission of other areas resulted in a final expenditure estimate which is believed to be an understatement of at least $500 million.

Chapter IV Problems of Input Analysis

The starting point for the interindustry analysis of inputs for the construction industry was the official Commerce-Labor series on value of work put-in-place that year by type of activity. For each of the major types of construction activity and for component subcategories [30] an attempt was made to establish control totals for materials, supplies, on-site labor, profit, and overhead. The next step was to analyze each of these major expenditures and to establish the proportion going for specific materials and for nonmaterial expenses. In its final form, this breakdown had to be in sufficient detail to make possible a recapitulation of expenditures in terms of Standard Industrial Classification (SIC) industries, or the combinations thereof

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[30] For example, within the major construction category Natural and Manufactured Gas, control totals were set up for the major components, natural vs. manufactured gas. Within the former, control totals were derived for collection, transmission, storage, distribution, and general building facilities; and within the latter for manufacturing, distribution, storage, and general building facilities. Input distributions were derived for the aggregate totals for transmission, storage, distribution, manufacturing, and general building facilities. Likewise, the major construction category Electric Light and Power was analyzed in two major components, privately-owned electric light and power companies, and rural cooperatives. Within the former, control totals and input distributions were derived for structures and improvements, boiler plant equipment, reservoirs, dams and waterways, towers and fixtures, poles and fixtures, overhead conductors and devices, underground conduits, underground conductors and devices, and street lighting and signal systems. The latter was analyzed independently.

that are being used in the interindustry study. Throughout the analysis in which primary emphasis was being placed upon the allocation of material costs, the aggregate allocation to labor and other overhead costs was deliberately maintained at a minimum to allow for greater absorption of material allocations. This procedure, previously noted, created distortions in the distribution of nonmaterial costs.

Prior to the current interindustry analyses of the construction industry, only two studies of any consequence had been made in which input data for the construction industry were obtained in any detail. The Bureau's Division of Construction Statistics completed a study of Expenditures for Labor and Material and Man-Hours of Labor Created for $1,000,000 of Contracts Awarded for about a dozen types of construction (heavy engineering and buildings) carried out under the Public Works Administration program, 1935-42. The nonmaterial costs were limited to two broad types; labor at construction site, and other expenses and profits, with no breakdown for either of these. The material input detail varied among the different types of activity and was usually limited to general material categories which either cut across or represented substantial aggregation of SIC categories. These classifications obviously did not give the detail needed for the current interindustry analysis. Further, all costs in this study had been adjusted to a 1940 price level. This adjustment, applied to a 7-year period, left considerable doubt as to the internal consistency of the resulting estimates. 31/

A somewhat similar type of study was made by the Department of Commerce in 1947 with results published in the Construction and Construction Materials Industry Report, Construction Division, Bureau of Foreign and Domestic Commerce, Department of Commerce, August 1948. However, the scope of this investigation was so limited as to restrict its value in the interindustry study. Total construction was divided into 15 classifications, and the consumption of 20 materials was estimated for each of these for 1947 and 1948. 32/ These physical quantities were

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31/ The only use made of the results of this study for the interindustry analyses was the comparison of aggregate relationships between material and nonmaterial costs, and occasionally proportions of total expenditure represented by a major material.

32/ For interindustry analytical purposes, classes of construction listed in the Commerce-Labor series were not in sufficient detail. Ultimately, the analyses involved about 90 major classes of construction activity, and these were further analyzed by subcomponents generally on the basis of types of construction. (See footnote 30 for examples of a breakdown of a Commerce-Labor classification into components.) Analyses of material requirements were made for each component. Materials were classified in 136 I-O sectors, comparable with at least 150 SIC groups.

based upon consumption per million dollars of construction. No attempt was made to estimate the value of other materials consumed in construction or the level of nonmaterial costs generated during the installation in order to ascertain whether the allocations were consistent with the existing control totals. These and other qualifying factors considerably reduced the value of this study. The results of these studies highlighted a basic problem faced in any undertaking of this type; namely, the unavailability or inaccessability of detailed input data.

The magnitude of any attempt to collect detailed input data for both the material and nonmaterial costs in the construction industry becomes apparent when one considers the complexity of the industry. According to Bureau of Internal Revenue data, there were 72,000 general contractors, 304,000 special trades contractors and subcontractors, and 17,000 contractors in unclassified groups engaged in the contract construction industry in 1947. 33/ This is exclusive of private and governmental organizations operating with force account crews. There is comparatively little uniformity of final product within some of the major categories of construction activity. A review of the F. W. Dodge Corp.'s Project Classification Chart presents a limited indication of the multiplicity of structures contained within any particular category. A brief examination of architectural, engineering, and building periodicals will indicate to some extent the complexity of the problem with respect to variation in types of buildings, and the wide choice of satisfactory materials for particular uses. Furthermore, there are not many organizations which collect data on consumption of construction materials, and virtually all of these limit this activity to a very few materials, usually only one. This drawback assumes major proportions because the construction industry purchases materials from practically all industries in the economy, more so than almost any other industry. Because of these formidable problems the search for sources of data and the fashioning of tools and techniques to utilize what is unearthed become the entire focus of a study of this type.

An intensive investigation into available secondary sources revealed that material consumption data and estimates were available, usually in unpublished and untabulated form, and in varying quantity and quality for the different types of construction. The major Federal agencies engaged in conservation and development construction were able

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33/ In the 1951 edition of National Income (Office of Business Economics, Bureau of Foreign and Domestic Commerce, Department of Commerce) the active number of proprietors of unincorporated enterprises in the construction industry was estimated at 984,000 (p. 187). This figure includes individual enterprises excluded from the BIR construction category. These include persons working on their own account as self-employed workmen, either as their ordinary occupation, seasonally, or in the evenings and on weekends ("moonlight contractors").

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

to supply some detailed material inputs. Inputs for railroads were obtained from records of the Association of American Railroads and Interstate Commerce Commission. The Bureau of Public Roads supplied data for highway, road, and street construction. Data obtained from these and similar sources were not very well suited for a highly accurate statistical analysis. The limitations of the project prevented any large scale recourse to scientifically designed samples of types of construction. 34/ Thus, it was necessary to work with any information which could be procured, requiring, of course, extensive manipulation of basic data.

An important aid in the analysis was the simultaneous investigation of aggregate material inputs to construction by the analysts responsible for distributing the output of industries producing construction materials. 35/ They had to allocate the entire 1947 production, or shipments, of their industries, working from control totals usually based upon the 1947 Census of Manufactures or 1947 Minerals Year Book of the Bureau of Mines. Information for the allocations was developed from varied sources. The Census of Manufactures gathered information on industrial consumption of metals and other important materials; trade associations had cost analyses of their industries; the Iron and Steel Institute possessed data on important industrial customers; and the Minerals Year Book listed consumption by industry of products of the mining industry. There were other sources too numerous to mention. Where information was available from both the production and consumption sides, the data were appraised and reconciled. Thus, operating from both the producing and consuming ends, it was possible to arrive at tentative control totals for the materials consumption by the entire construction industry.

In some instances the control totals were determined as a result of the analysis of the various construction activities consuming specific materials, e.g. explosives, certain chemicals, millwork, and steel works and rolling mill products. In other instances, the analyst responsible for material outputs, after allocating as much as possible to other consuming industries, transferred the residual to construction, e.g., structural clay products, glass, cement, and structural and ornamental metal. Except for approximately $150 million, the total materials allocation to construction was accepted and distributed to the various construction activities. In a few instances, it was felt that too much of a particular material had been assigned to certain types of construction activity, but because these materials were very definitely

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34/The two surveys which were undertaken for sewer and water construction, and oil and gas well drilling were not for a scientifically designed sample but rather a judgment type sample influenced by the availability of data from respondents contacted.

35/These inputs were at producers' prices, but supplementary data on such items as transportation costs, trade margins, and excise taxes permitted conversion to purchasers' value.

construction items and could not be absorbed elsewhere, they had to be consumed in construction. This situation was to be expected in view of the fact that the total expenditure level appears to be understated by a few hundred million dollars.

It was pointed out earlier that the major emphasis in the input analysis was upon consumption of material as against nonmaterial and other overhead costs to such an extent that the aggregate expenditure allotted to the later segment was actually below a reasonable minimum. One of the reasons for the acceptance of the material allocations was that definite production and shipment control totals were available allowing fairly accurate allocations to consuming industries, whereas control totals in the nonmaterial and other overhead cost components were practically nonexistent except in aggregate. Furthermore, allocations from this latter segment were not separately investigated on the output side until after most of the material allocations to construction had been accepted.

Although source data were obtained which made available some distribution of material inputs, little information was available indicating a distribution of the nonmaterial and other overhead costs in sufficient detail for interindustry purposes. No source showed expenditures for telephone charges, profits, or payment of rents for specific types of construction activities. Aside from information obtained from the oil and gas well drilling survey, available nonmaterial costs rarely indicated a more detailed breakdown than labor, and combined profit and other overhead costs. Frequently there was no clear cut concept of labor cost though the attempt was made to segregate the on-site labor costs from other wages, salaries, officers compensation, and social security payments usually carried in other overhead costs. Hence, aside from the labor cost, there was no direct method of checking the accuracy of the levels of the allocation to construction because most control totals were not directly obtained from primary source data.

With a more or less firm control total for aggregate material consumption, and a somewhat less rigid total for on-site labor costs, it became necessary to evaluate and distribute the nonmaterial and other overhead costs within the limits of the residual. Some of these costs were calculated in the course of the individual construction activity analyses, e.g., architectural and engineering fees, and off-site salaries and wages. The estimate for construction equipment rental charges was obtained from the Associated Equipment Distributors Association. Other aggregate costs were derived from Bureau of Internal Revenue sources and Old Age and Survivors Insurance published data, e.g., profits after taxes, depreciation, and social security. In these and some other instances, the totals were more or less fixed within certain bounds. However, for most of the nonmaterial and other overhead costs, the aggregate control total estimates worked out by the analysts were carefully reviewed and in most instances reduced, because there was an insufficient residual to absorb the total allocated. In fact, certain expenditures and costs which are an integral part of any business overhead had to be excluded completely, e.g., office materials and supplies, contributions and gifts,

legal services, and club and association dues. 36/

Determination of the aggregate control totals in this segment represented the first step in the distribution of these costs among the various types of construction activity. As mentioned previously, the on-site labor cost was probably the most accurate of the nonmaterial costs distributed among the various activities. With some exceptions, depending upon the source of input data, most of the nonmaterial and other overhead costs were distributed among the construction activities on the basis of judgment, but within control totals set by the undistributed residual within each type of activity. Thus, a considerable portion of the total designated as equipment depreciation, maintenance, and repair was absorbed in highway construction, and conservation and development construction. However, neither category was allotted any for hire trucking expenditures. Each of the nonmaterial and other overhead costs was appraised within each construction activity until distribution was complete. This method was certainly not scientific but in view of the data available, it was the only method which could be used. The entire amount of understatement known to exist in this nonmaterial segment was forced into those categories with the least reliable control totals. The importance of these distortions was reduced by the fact that there was basis for good estimates of on-site wages, and for reasonably good estimates of profit, depreciation of equipment, nonlife insurance, and a few other items; in the aggregate, these made up the bulk of nonmaterial costs.

Expenditures in the construction industry have always been in terms of value installed and breakdown by element of cost are in terms of cost to the contractors.

Hence, the entire analysis was made at a price level which included transportation costs, trade margins, and excise taxes. However, with data on these intermediate costs available for each I-O category, it was possible to make adjustments to the purchaser's level to derive producer's values. These intermediate costs or charges were available in aggregate form only and distribution had to be made to all types of construction. The major problem in this procedure was the distribution of trade margins between new and maintenance construction (the latter would carry a higher margin) and among types of activities (cement sold for new highway construction would carry a smaller margin than cement sold for new residential construction). A higher margin would reduce the value at producer's level and hence reduce physical quantity.

The aggregate distribution of material and nonmaterial inputs in producer's value and in purchaser's value for total construction is presented in table 3.

36/ Although some $14 million in travel expenses were allocated to construction, the actual total is believed to be considerably higher. The present allocation represents a token estimate.

Chapter V Distribution of Output of the Construction Industry

Total output of the construction industry in 1947 as estimated for the interindustry study amounted to $19,702 million for new structures, and $9,002 million for maintenance and repair of existing structures. The new construction activity segment was composed of $16,204 million in privately owned facilities, and $3,498 million in public structures. The new construction expenditures by the private sector of the economy are considered as a new capital outlay and carried in the final demand section of the chart as "gross private capital formation". New public construction is also in the final demand section, but appears as a purchase by government.

The distribution of the output of the maintenance and repair segment could not be disposed of as easily as that for new construction. Maintenance and repair construction expenditures are part of current operating expenses for most industries. Of the 420 I-O industries purchasing this activity, allocations to 10, amounting to $5,110 million, were obtained from the separate components of the revised construction expenditure series. 37/ Allocation of expenditures to the remaining 410 industries involved the application of a series of statistical processes to the available data.

The basic information for these remaining industries was obtained from the Bureau of Internal Revenue 1947 Corporate Returns by BIR industry classification, and other published and unpublished related data. The broad general outlines of the technique utilized to derive the value of construction maintenance and repair purchased by the manufacturing, mining, trade and service industries from these data is presented in the following series of calculations. As is apparent below, some of the steps consist of multiplication by ratios. This procedure was necessary when BIR data did not give the desired figures for 1947 but did give related figures, and the ratios could be computed from data for 1948 or had been prepared in other estimates. The maintenance and repair expenditures for these industry groups were prepared as follows:

1. Total corporate expenditures for maintenance and repairs of buildings were obtained by adding tenant expenditures (item 2), expenditures by owners of rented property (item 3), and expenditures on property owned and occupied (item 4).

37/ Maintenance and repair expenditures were directly available for railroads, pipe line transportation (petroleum), local transit, telephone, telegraph, electric light and power, natural gas transmission and distribution, residential maintenance and repair by property owners, and residential maintenance and repair by tenants.

2. Tenant expenditures on maintenance and repair of rented property were estimated by multiplying corporate rents paid, by the ratio of repair expense for rented space to rents paid — 5 percent. (This ratio was developed in an interindustry analysis of business rents.)

3. Owners' expenditures for repairs of rented property were estimated by multiplying the BIR figure for corporate rents received by the ratio of owners' repairs to rents received — 3 percent. (This ratio was also developed in the interindustry analysis of business rents.)

4. The estimated expenditures for maintenance and repairs of buildings owned and occupied were derived by multiplying the estimate of repairs to owned buildings and equipment (item 5) by the ratio between depreciation on owned and occupied buildings, and depreciation on owned and occupied buildings and equipment (item 6).

5. Repairs to owned and occupied buildings and equipment were estimated by subtracting the estimate of tenant expenditures (item 2) and owners' expenditures on rented property (item 3) from the BIR figure for total maintenance and repair expenditures for buildings and equipment.

6. The ratio between depreciation on owned and occupied buildings, and owned and occupied buildings and equipment, was obtained by dividing the difference between the depreciation on all buildings (item 7) and the depreciation on rented buildings (item 8), by the difference between the BIR figure for total depreciation for buildings and equipment and the depreciation on rented buildings (item 8).

7. Depreciation on all buildings was estimated by multiplying the BIR figure for total depreciation charged by the estimated ratio of building depreciation to total depreciation. [38]

8. Depreciation on rented buildings was estimated by multiplying the BIR figure for corporate rents received, by a ratio of depreciation to rental which was derived in the interindustry analysis of business rents.

The corporate construction maintenance and repair estimate was adjusted to cover total expenditures for 330 I-O manufacturing industries by applying the ratio between corporate maintenance and repair (item 8) and corporate receipts from operations to total shipments as reported in the 1947 Census of Manufactures. Similar techniques were applied to the 19 I-O mining industries and to 32 of the I-O trade and service industries.

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[38] Obtained from an unpublished Treasury Department study.

Construction maintenance purchased by the farm dwelling rents industry consisted of the total maintenance expenditures for owner and tenant occupied dwelling units; the farm nonresidential building rents industry expenditure was based upon the ratio of the value of rented to owned service buildings. The expenditures by the remaining 17 agricultural industries, e.g., meat animals and dairy products, were determined on the basis of cash receipts and estimated average value of service buildings.

The allocation of construction maintenance expenditures to schools, hospitals, institutions, [39] and the two government sectors (Federal and nonFederal) was estimated in the study of these sectors by the use of expenditure data secured from numerous sources such as Federal budget data, and State and local operating statements. The maintenance expenditures for the few remaining industries were derived more or less incidentally in the study of overhead expenditures in the various industry analyses. A consolidated distribution of these construction maintenance and repair costs is presented in table 4.

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[39] Public and private expenditures were combined in the allocation to schools, hospitals, and institutions.

Appendix A

1. Nonfarm Residential Additions and Alterations, and Maintenance and Repair Estimates, 1947

The levels of activity for addition and alteration, and maintenance and repair construction used in the interindustry analysis are $1,183 and $3,300 million, respectively, compared with the current Commerce-Labor total of $735 million for additions and alterations and the Commerce estimate of $2,200 million for maintenance and repair. The interindustry estimates resulted from a reexamination of estimating methods used in the current series and other source materials indicating understatement in the current estimates.

The Federal Reserve Board Survey of Consumer Finances for the years 1948 and 1949 reported that expenditures by home owners for maintenance, repairs, additions, alterations, and renovations, and expenditures for garages, driveways, fences, and other similar items, amounted to approximately $5 billion in 1947 and $6 billion in 1948. Information obtained from other sources familiar with mortgage data, bank loans, and sales by building material dealers for this type of activity appear to support the higher FRB levels. The Commerce-Labor totals for maintenance, repair, additions, and alterations for these 2 years are $2.9 and $3.4 billion. These totals are not directly comparable because of differences in coverage. The Commerce-Labor estimates omit expenditures for garages, driveways, fences, and similar property improvements, whereas the FRB total does not include expenditures for maintenance and repair on tenant-occupied dwelling units and includes farm expenditures. Adjustments were made to bring about conceptually comparable levels of activity.

The FRB totals include expenditures for garages estimated at $210 million (p. 13), nonbuilding residential improvements of $50 million (p. 10), farm residential maintenance and repair of $192 million (Appendix A-2), and an estimate of $125 million for farm additions and alterations. Conceptually, the FRB construction estimate excluded expenditures for such household purchases as refrigerators, washing machines, and other household appliances. However, making an allowance of 2 percent for these nonconstruction items which may have been included in the construction figure and for fringe items such as blinds and shades, an additional $100 million should be deducted from the FRB total. Elimination of these three items would reduce the FRB expenditures for maintenance, repair, additions, and alterations by home owners to approximately $4,300 million in 1947.

The Commerce-Labor estimate of $2,935 million for additions, alterations, maintenance, and repairs combines expenditures by both home owners and owners of rental property. It can be safely assumed that a considerable volume of addition and alteration work was done by owners of rented property. Although in number of projects, those performed

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in owner-occupied homes would outnumber those in rental properties, the dollar value per project would be greater in the latter group. Estimating that 25 percent of the $735 million addition and alteration expenditure was the volume undertaken in rented properties resulted in a $184 million allocation to tenant-occupied units. Furthermore, in 1947, approximately $800 million of the $2,200 million maintenance and repair expenditures was made by owners of rented property on tenant-occupied units. Hence, expenditures by home owners for both major categories were placed at $1,951 million in the current estimate, and by owners on rented property at $984 million.

The discrepancy between the FRB and Commerce-Labor expenditures by home owners thus amounts to approximately $2.3 billion. The FRB sample in the survey was small but in the 2 years for which these data were published the results were consistent; in both years they were greater than the Commerce-Labor estimate by more than 70 percent. 40/

The above discussion in itself does not provide a specific measure of the level of expenditures. However, it does provide a basis for the conclusion that there is an understatement in the current series, in addition to those presented in the discussion that follows of the estimates incorporated in the interindustry study.

Residential Additions and Alterations (Table B-2, Line 5)

The basic source of data for this type of construction activity is BLS 404, Report of Building Permits Issued. 41/ The total value of permits issued in urban areas for additions and alterations amounted to $215 million in 1946 and $367 million in 1947. Allowing for a lapse of 1 month between issuance of permit and start, and a completion period of 3 months, approximately $355 million was put in place in 1947. An additional month longer or shorter completion period would not affect the in-place total to any significant degree.

Adjustment for undercoverage and understatement presented the major problem in this activity. There is no uniform definition for "additions and alterations" in the approximately 5,100 building codes in this country. Considerable leeway is granted in interpretation of this phrase and evasion is widespread. In addition, there is a wide variation in the lower limits above which a permit is required. Because a substantial amount of this activity is done within the confines

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40/ Unpublished estimates for succeeding years are also higher than the published Commerce-Labor estimates.

41/ BLS 404 excludes public construction activity and this entire discussion relates to private expenditures only. In view of the comparatively small volume of publicly owned residential units, and the assumption that additions would be small, an adjustment was not made for this segment. In some instances the BLS 404 includes maintenance and repair but the amount is believed small.

of the structure, the likelihood of evasion is increased, especially so with respect to conversions in zoned areas. Results of surveys made by BLS in Baltimore and Norfolk for the years 1948 and 1949 indicated that required building permits were taken out in less than 25 percent of those instances in which conversion occurred in residential structures. In 1947, the latter type of construction, legal and otherwise, was considerable. The conclusion can readily be drawn that the total valuation of permits issued for additions and alterations in urban areas is a gross understatement of the actual activity.

In view of the above mentioned factors, it follows that judgment estimates would be necessary in adjusting the permit valuation figure. If new residential construction were adjusted 25 percent for understatement in the derivation of the official series for new residential building, it would not be unreasonable to assume that understatement in this category would be considerably higher — perhaps as high as 45 percent. It was further estimated that the value of construction falling below the valuation for which a permit is required was 30 percent. Evasions, illegal and otherwise, were estimated at 50 percent, although there is strong belief in some quarters that these evasions may be as great as the value of permits issued. These adjustments add to 125 percent of the total urban permit valuation and may well be on the conservative side. Urban activity estimated at 125 percent above the permit valuation of $355 million, amounted to a total activity level of $799 million.

The adjustment for rural nonfarm residential additions and alterations was based upon the inventory and rate of construction in that area. In 1947, total rural nonfarm housing comprised approximately 33 percent of the total nonfarm housing inventory. However, it is necessary to take into account the fact that new construction in rural nonfarm areas was proceeding at a much higher rate; in 1947, approximately 45 percent of nonfarm building was in rural nonfarm areas. If the total inventory ratio were used to estimate rural nonfarm additions and alterations, expenditures would be approximately half those of urban. However, two adjustments must be made. The first is an increase to account for the higher rate of postwar construction. The second is a downward revision for the smaller volume of conversions in this area. The final estimate for additions and alterations in rural nonfarm areas was set at $384 million, or 48 percent of urban expenditures.

Total expenditures for nonfarm residential additions and alterations amounted to $1,183 million.

Maintenance and Repair

In the general discussion above, the FRB estimates of expenditures by home owners for additions, alterations, maintenance and repair, adjusted downward for garages, property improvement and other costs, amounted to approximately $4,300 million. Adding the estimated $984 million expenditure on tenant-occupied units for additions, alterations,

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

maintenance and repair, currently included in the Commerce-Labor totals to the $4,300 million FRB figure would bring total expenditures for these activities to approximately $5,284 million. Thus, the current Commerce-Labor figure for maintenance, repair, additions, and alterations can be considered comparable to the adjusted FRB figure of $5,284 million. Subtracting the $1,183 million expenditure for additions and alterations derived in the preceding section results in a residual of approximately $4,100 million for all residential maintenance and repair.

The $4,100 million obtained in the above calculation can be considered comparable to the current Commerce-Labor $2,200 million estimate for all residential maintenance and repair by home owners and owners of rental property. In order to take into account any possible upward bias in the original FRB figure, an upward adjustment of 50 percent was made in the current $2,200 million estimate. The interindustry figure of $3,300 million is still about $800 million under the adjusted FRB estimate.

The interindustry study incorporated the revised estimates of $1,183 million for additions and alterations and $3,300 million for maintenance and repair in its analysis. This total of $4,483 million is almost 53 percent above the current levels. Although there may be specific definitions of additions, alterations, renovations, betterment, and maintenance and repair, sharp demarcation between each of these items is not always possible. Frequently a single project will include part or all of these activities. Hence, although the individual allocations to additions and alterations and maintenance and repair may tend to be overstated or understated in relation to each other, the total magnitude of the combined activities is assumed to be at the proper level of expenditures.

2. Farm Construction Activity

The currently published Commerce-Labor series for farm construction lists expenditures of $1,272 million for new activity and $682 million for maintenance and repair activity in 1947. According to the Commerce Department description, these figures included expenditures for operators' dwellings and service buildings. This latter category included "barns and other buildings used in production, dwellings other than operators' dwellings, and fences, windmills, and wells". A review of the Bureau of Agricultural Economics, U. S. Department of Agriculture survey upon which this figure was based indicated that the coverage was not exactly as described.

The 1947 construction activity estimates were based upon the BAE farm construction survey completed for 1946. This study was limited to farm buildings only, and excluded costs for fencing, wells, and windmills. The survey for 1936 had included expenditures for these items. This earlier study provided the base for activity estimates for the following decade, and the description of coverage for this earlier study apparently was applied to the estimates for 1946 and succeeding years. Because the 1947 activity figures did not include these items, an upward adjustment

of $120 million was made to the current series. This was done prior to the release of the results of the BAE study for 1950.

The results of this later study required revision of the assumptions made previously. Although this study did take into account expenditures for fencing, pumps, and windmills, the net increase over the current series was only $17 million. This results from the fact that the $315 million expenditure for fences, windmills, and pumps was offset by a decrease of $298 million in the level of expenditures for buildings. Although the net change between the current Commerce-Labor and revised BAE figure is minor, the change in the structural mix represents a significant difference in the types of materials consumed.

The Department of Commerce has been responsible for distributing the BAE aggregate expenditure level between new and maintenance construction for operators' dwellings and service buildings. However, no revisions have been incorporated in the current series and since the revisions will not be available until after this analysis has been completed, it was necessary to make a preliminary distribution for the interindustry study.

The currently published Commerce-Labor series distributed expenditures between new and maintenance construction for the period 1946-50 on the basis of the 1946 study. The proportions derived from that survey were applied to the aggregate construction expenditure estimates of BAE for the succeeding years. The 1950 survey, as indicated in the following tabulation, presents a substantially different distribution.

Comparison of BAE study of expenditures with current series (1946-50), by type of activity

(Percent)

Source	Farm houses			Service buildings		
	Total	New	Repair	Total	New	Repair
1950 survey	100	79	21	100	81	19
Current series	100	59	41	100	72	28

Following conversations with BAE technicians who were familiar with the results of the 1946 and 1950 surveys, the ratios derived in the latter study were applied to the 1947 expenditures for building construction. In the earlier survey, expenditures for maintenance and repair, and additions and alterations were not clearly distinguished. As a result, it is believed that major improvements were frequently included in maintenance and repair outlays. In the 1950 survey, respondents were specifically requested to list expenditures for new buildings and major improvements as distinct from maintenance and repair. The ratios obtained in the 1950 study were applied directly to the 1947 expenditures for buildings.

In applying the 1950 ratios to the revised 1947 expenditures, the nonbuilding construction segment was treated independently. The percentage distribution between new and repair (including replacements and maintenance) in the previous table, 79-21 and 81-19 respectively, was applied to expenditures for operators' dwellings, tenant dwellings, and service buildings. The comparable distributions for fencing, pumps, and windmills of 15-85, 73-27, and 32-68 percent respectively were estimated in cooperation with technicians in Production and Management Administration. Applying these new ratios to the revised 1947 expenditure estimates for building and nonbuilding construction resulted in the following distribution:

Expenditures for farm construction,
by type of activity, 1947

(In millions)

Type of construction	BAE total	Interindustry distribution	
		New 1/	Maintenance and repair
Total	$ 1,971	$ 1,432	$ 539
Total buildings	1,656	1,321	335
Operators' dwellings ...	867	683	184
Tenant dwellings	173	140	33
Service buildings	616	498	118
Total nonbuildings	315	111	204
Fences	181	27	154
Pumps	100	73	27
Windmills	34	11	23

1/ Includes replacements.

One type of farm construction activity which has not appeared in any of the expenditure series is land betterment. This category includes such activities as irrigation, drainage, and related activities. At present, there are no data from which an expenditure time series can be derived. However, some information was available in Production and Marketing Administration. Expenditures for this activity were estimated at $157 million in new construction and $10 million for maintenance and repair in 1947. The total farm construction expenditure estimate ($2,138 million) used in the interindustry study is therefore $167 million higher than the revised BAE estimate and $184 million above the current Commerce-Labor figures.

3. Nonfarm Residential Dwelling Units

The current nonfarm residential dwelling unit construction expenditure estimate does not present the complete picture of total cost for nonfarm residential housing to the final consumer. The current series includes the cost of land development, architectural and engineering fees, and the cost of erecting the structure. However, certain other costs

included in the final sales price or cost to the owner have been omitted because they are not considered to be conceptually within the definition of construction. These additional items entering the final price of residential dwelling units, and an estimate of their costs are presented in the following discussion.

Equipment Costs

The current Commerce-Labor estimates conceptually exclude certain costs entering the sales price of a residential structure on the ground that they represent equipment purchases and are not construction materials. The largest items involved in this category are ranges and refrigerators. Customs vary among regions as to whether these items are included in the final sales price. In certain regions, it had been the custom prior to 1940 to omit one or both of these pieces of equipment. This procedure might have been carried over to the postwar period. However, because of shortages, it was assumed that a range and refrigerator was included in just about all dwelling units.

Although conceptually ranges and refrigerators were excluded from the residential permit valuations, expenditures for these items were not completely eliminated in 1947, and in the analysis of residential construction allowances were made for inclusion of ranges and refrigerators in about 20 percent of the number of units. To cover these items in all new dwelling units in 1947, an additional $78 million should be added for ranges, and $123 million for refrigerators.

The other items included in purchase price are venetian blinds and window shades. There are no data available which would indicate the extent to which either type is used in new residential construction. Roughly estimating the total number of windows in new residential units, and roughly estimating the use of shades as against venetian blinds, a final rough estimate of expenditures was derived, $13 million for the former and $9 million for the latter. These estimates are equivalent, respectively to approximately 50 and 40 percent of the allocation of these items to households.

On the basis of the above analysis, total "equipment" cost currently excluded from the Commerce-Labor and Interindustry expenditures for residential dwellings is estimated at $223 million. Total value of construction and "equipment" amounts to $5,673 million.

Speculative or Operative Builders' Gross "Profit"

Speculative builders' profits are excluded from the residential construction expenditures. Conceptually, these "profits" include the profit made by the builder on the sales of the land to the purchaser and the difference between the construction cost and selling price of the structure erected. The speculative builder, however, does not maintain these fine distinctions and fictions required for a statistical study. After computing all costs involved in development of the site from an undeveloped area to a completed project, a percentage or dollar amount is

added to the "developmental" cost, and the selling price is settled. Conceptually, the costs incurred by the speculative builder which are comparable to those incurred by the building contractor are included in the current expenditure series.

There is very little data available from which a fairly accurate estimate of operative builders' profits can be derived, and under present circumstances only a crude estimate can be made. The Builder Panel Surveys [42] presented the sole source from which an indication could be obtained of the scope of construction activity by the operative builders. After adjusting for differences in definition (rental units in multifamily were considered operatively built in the survey), the survey results indicated that in 1949 approximately 45 percent of the one- and two-family units were erected by operative builders. For this analysis it was assumed that this proportion could be applied to 1947.

It was estimated that 801,000 equivalent 1- and 2-family units were constructed in 1947 with a value estimated at $4,948 million. In estimating speculative builders profits, only 1- and 2-family units will be in the computation; multifamily structures, in the sense used in this analysis, are usually not speculatively built. The expenditure estimated was adjusted to $5,169 million to include the normal "equipment items" (all ranges and refrigerators in the estimate and 90 percent of the shades and venetian blinds -- the other 10 percent allocated to the multifamily units). The average cost of the contractor-built homes is higher than the average cost of the speculatively built homes. However, the average cost of owner-built homes is lower. For this analysis it was assumed that one would balance the other and tend to bring average cost to a common level. Therefore, the 45 percent proportion was applied to the adjusted 1947 expenditure for 1- and 2-family units. On this basis, the value put-in-place by speculative builders amounted to $2,326 million.

The question of the speculative or operative building profit ratio was discussed with persons familiar with the field. There was general agreement that there is no definite information available. However, considering the fact that 1947 was a seller's market, there appeared to be a general consensus that the net profit, excluding overhead, ran about 15 percent and gross, including overhead, a few percent higher, about 17 percent. Applying these estimates to the $2,326 million results in a gross speculative builders' profit of $395 million and a net of $349 million.

Settlement Costs

From the purchaser-end other expenses are included prior to transfer of title and settlement charges. The settlement charges include title insurance, mortgage service charge, property survey, closing fees,

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[42] A press release on this study was issued jointly by the Bureau of Labor Statistics and Housing and Home Finance Agency, August 25-26, 1951, entitled 120,000 Firms in Residential Building Industry in 1949.

appraisal report, inspection fees, credit report, recording fees, taxes on mortgage, stamps, and a host of other miscellaneous charges; hazard insurance and prepaid taxes, which are usually collected during the settlement procedure, are not included in these costs. There is no uniformity among closing costs and data for the Nation as a whole are not available. However, it was roughly estimated that these charges averaged $200 per unit for single-family structures and $25 per unit for multifamily structures, or an aggregate of $162 million.

Land Cost

Although the cost of land has been excluded from construction expenditures, it enters into this discussion as a real cost to the purchaser of a dwelling unit. The cost of land varies considerably depending upon such factors as location and development. After weighing all possible pros and cons, it was decided to place an average cost of $400 per lot for single-family structures and $75 per multifamily unit. Total cost of land to the owner amounted to approximately $326 million.

Summary

Distribution of expenditures entering final costs of nonfarm residential dwelling units, 1947

(In millions)

Item	Expenditure
Total	$ 6,556
Construction cost	5,450
Equipment costs	223
Speculative builders' profit	395
Settlement costs	162
Land costs	326

Appendix B

Table B-1. Estimated distribution of construction expenditures, by activity and type of construction, 1947

(in thousands of dollars)

Construction activity	Total 1/	Type of construction		
		Contract 2/	Force account 3/	Nonpaid 4/
Total expenditures	$28,704,033	$19,554,208	$6,131,825	$3,018,000
New construction	19,702,093	16,485,583	1,978,510	1,238,000
New residential dwelling units	5,650,000	5,550,000	...	5/ 100,000
Nonhousekeeping residential	125,000	125,000	...	...
Residential additions and alterations	1,183,000	828,000	...	6/ 355,000
Nonbuilding residential improvements ..	50,000	27,000	...	6/ 23,000
Industrial	2,418,000	2,018,000	7/ 400,000	...
Commercial	1,071,000	1,026,000	6/ 45,000	...
Educational, hospital, institutional	699,000	689,000	6/ 10,000	...
All other nonresidential	766,000	655,000	6/ 15,000	8/ 96,000
Operators' dwellings, farm	701,000	500,000	...	9/ 201,000
Tenant dwellings, farm	151,000	60,000	...	9/ 91,000
Service buildings, farm	580,000	240,000	...	9/ 340,000
Land betterment, farm	157,000	125,000	...	6/ 32,000
Railroad	286,510	100,000	10/ 186,510	...
Electric light and power	793,000	359,000	11/ 434,000	...
Natural and manufactured gas	540,000	490,000	12/ 50,000	...
Telephone and telegraph	510,000	175,000	13/ 335,000	...
Sewage disposal	189,000	184,000	14/ 5,000	...
Water supply	226,000	186,000	14/ 40,000	...
Petroleum pipeline ..	121,000	109,000	12/ 12,000	...
Local transit	85,000	79,000	6/ 6,000	...
All other public service enterprises	135,000	123,000	6/ 12,000	...
Highways, roads, and streets	1,485,200	1,300,200	15/ 185,000	...
Conservation and development	394,000	366,000	16/ 28,000	...

See footnotes at end of table.

Table B-1. Estimated distribution of construction expenditures, by activity and type of construction, 1947 - continued

(in thousands of dollars)

Construction activity	Total 1/	Type of construction		
		Contract 2/	Force account 3/	Nonpaid 4/
New construction - continued				
Crude petroleum and natural gas drilling	$1,076,383	$861,383	17/ $215,000	...
Military and naval	204,000	204,000	...	...
All other new construction	106,000	106,000	...	...
Maintenance and repair	9,001,940	3,068,625	4,153,315	$1,780,000
Residential (home owners and owners of rental units)	3,300,000	2,000,000	6/ 165,000	18/1,135,000
Tenant expenditures	154,000	54,000	...	6/ 100,000
Nonresidential	1,600,000	653,000	19/ 936,000	6/ 11,000
Operators' dwellings, farm	192,000	25,000	...	9/ 167,000
Tenant dwellings, farm	36,000	4,000	...	9/ 32,000
Service buildings, farm	311,000	10,000	...	9/ 301,000
Land betterment, farm	10,000	1,000	...	9/ 9,000
Railroad	1,118,243	...	10/1,118,243	...
Electric light and power	172,000	5,000	20/ 167,000	...
Natural and manufactured gas	87,000	2,000	20/ 85,000	...
Telephone and telegraph	178,000	4,000	13/ 174,000	...
Sewage disposal and water supply	135,000	5,000	20/ 130,000	...
Petroleum pipe line	31,164	625	20/ 30,539	...
Local transit	69,533	...	20/ 69,533	...
All other public service enterprises	50,000	3,000	20/ 47,000	...
Highways, roads, and streets	1,148,000	107,000	1,041,000	...
Conservation and development	235,000	45,000	190,000	...
Military and naval	175,000	150,000	...	21/ 25,000

1/ Levels of expenditures presented in this table represent the control totals used in the interindustry study.

Footnotes continued on next page.

Notes to Table B-1 - continued

2/ Work done by private firms engaged in construction which work on a contract basis for others.

3/ Work done by a private business organization or a governmental unit which acts as its own general contractor and carries out the work by means of employees on its own payrolls.

4/ Value of materials put-in-place without any payment for labor; the imputed value of labor involved is not considered a cost of construction.

5/ Token estimate based upon results of builder panel survey indicating the large number of owner builders engaged in residential construction. See BLS release 120,000 Firms in Residential Industry in 1949, August 25 and 26, 1951.

6/ Judgment estimate.

7/ Estimate based upon volume of force account labor employed for construction as reported in 1947 Census of Manufactures. A recheck has indicated that the original reporting was low and any revision would increase this figure.

8/ Estimate based upon assumption that a substantial amount of materials would be put-in-place by owners for such nonresidential structures as private garages, sheds, road stands, etc.

9/ Based upon special tabulation of sample of selected items from the schedules of the Bureau of Agricultural Economics Survey of Farm Houses and Other Farm Buildings, May 1950, and discussion with technicians in Production and Marketing Administration, U. S. Department of Agriculture.

The release Farm Housing and Construction, U. S. Department of Agriculture, Bureau of Agricultural Economics, February 1952, contains estimates of the volume and imputed value of farm produced and salvaged lumber used in farm construction (board feet times prices paid by farmers for No. 2 pine and fir 2" x 4" x 16' lumber March 15, 1950) and an imputed value for nonpaid labor used for construction purposes (hours times April 1949 hourly composite farm wage rate by States). The following table is presented as an indication of the volume of this activity based upon a cash expenditure of $1,625 million which excluded outlays for fences, wells, windmills, and other nonbuilding items.

Footnotes continued on next page.

Notes to Table [illegible], continued

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Notes to Table B-1 - continued

9/ - continued

Farm labor and amount and value of farm produced materials consumed in farm construction, 1949

Type of construction	Labor		Lumber				Other materials (Mil. of dols.)
	Regular hired farm workers	Operators and unpaid family workers	Farm produced	New	Used		
	(millions of dollars)		(Mil. bd. ft.)	(Mil. of dols.)	(Mil. bd. ft.)	(Mil. of dols.)	
Total expenditures 1/...	32.4	164.1	666.8	58.2	263.0	24.5	2.0
New farm houses	3.4	17.1	113.9	8.4	45.2	4.4	.2
Major improvements to farm houses	3.5	53.7	71.2	6.0	15.3	1.4	.3
New service buildings	9.2	68.8	377.0	33.5	133.6	12.3	.9
Major improvements to service buildings ...	10.0	10.9	73.9	7.0	51.9	4.8	.4
Repairs to service buildings	6.3	13.6	30.8	3.3	17.0	1.6	.2

1/ Cost of repairing and painting farm houses not available.

10/ Estimate based upon analysis of Association of American Railways and Interstate Commerce Commission records.

11/ Based upon assumption that most outside plant construction is by force account labor.

12/ Based upon assumption that approximately 10 percent is force account construction and payments to company owner supervisors, inspectors, etc.

13/ Based upon data obtained from American Telephone and Telegraph Co. and Western Electric.

14/ Estimate derived in cooperation with technicians from Public Health Service.

15/ Based upon information obtained from Bureau of Public Roads.

16/ Value of Tennessee Valley Authority construction which was assumed to be all force account in 1947.

17/ Estimate based upon proportion of footage drilled directly by company-owner crews.

18/ Estimate based upon tabulation of specific items in a survey of consumer expenditures for 1947 taken by BLS.

19/ Based upon analysis of the type of maintenance construction for the component parts of this category.

20/ Based upon the assumption that the majority of maintenance and repair work would be accomplished by force account labor.

21/ Value of materials installed by station labor.

Table B-2. Revisions of current construction expenditure series incorporated into interindustry relations study, by type of activity and ownership, 1947

(In millions)

	Construction activity	Current Commerce-Labor series [1]	First order additions	Revisions total [2]	Final revisions		Distribution by ownership	
					Additions	Total	Private	Public
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Total expenditures	$24,835	$ 797	$25,632	$ 3,869	$28,704	$23,026	$ 5,678
2.	New construction	17,400	483	17,883	2,302	19,702	16,204	3,498
3.	Residential (excluding farms)	6,510	...	6,510	498	7,008	6,808	200
4.	New dwelling units	5,650	...	5,650	...	5,650	5,450	200
5.	Additions and alterations	735	...	735	[3] 448	1,183	1,183	...
6.	Nonhousekeeping	125	...	125	...	125	125	...
7.	Nonbuilding residential improvements	...	...	...	[4] 50	50	50	...
8.	Nonresidential building (excluding farms)	3,741	...	3,741	1,213	4,954	4,355	599
9.	Industrial	1,798	...	1,798	[5] 620	2,418	2,322	96
10.	Commercial (warehouse, office and loft buildings; stores, restaurants, garages)	856	...	856	[6] 215	1,071	1,071	...
11.	Educational, hospital, institutional	656	...	656	[6] 43	699	327	372
12.	All other nonresidential (religious, social, recreational, public administration, miscellaneous nonresidential)	431	...	431	[7] 335	766	635	131
13.	Farm	1,272	180	1,452	317	1,589	1,589	...
14.	Operators' dwellings	611	7	618	[8] 90	701	701	...
15.	Service buildings	661	16	677	[8] 70	731	731	...
16.	Land betterment	...	157	157	[9] 157	157	157	...

Table B-2. Revisions of current construction expenditure series incorporated into interindustry relations study, by type of activity and ownership, 1947 - continued

(In millions)

	Construction activity	Current Commerce-Labor series 1/	First order additions	Revisions total 2/	Final revisions		Distribution by ownership	
					Additions	Total	Private	Public
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	New construction - continued							
17.	Public utility	$ 2,338	$ -2	$2,336	$ -2	$ 2,336	$ 2,307	$ 29
18.	Railroad	318	-31	287	10/ -31	287	287	...
19.	Local transit	56	29	85	11/ 29	85	56	29
20.	Petroleum pipeline	121	...	121	...	121	121	...
21.	Electric light and power	793	...	793	...	793	793	...
22.	Natural and manufactured gas	540	...	540	...	540	540	...
23.	Telephone	502	...	502	...	502	502	...
24.	Telegraph	8	...	8	...	8	8	...
25.	Military and naval	204	...	204	...	204	...	204
26.	Sewer and water	384	31	415	31	415	33	382
27.	Sewage disposal	12/ 189	...	189	...	189	1	188
28.	Water supply	12/ 195	31	226	13/ 31	226	32	194
29.	Highways, roads, and streets	1,514	...	1,514	14/ -29	1,485	...	1,485
30.	Miscellaneous public service enterprises	164	-29	135	11/ -29	135	...	135
31.	Conservation and development	394	...	394	...	394	...	394
32.	All other	106	...	106	...	106	36	70
33.	Oil and gas well drilling	773	303	1,076	15/ 303	1,076	1,076	...
34.	Maintenance and repair	7,435	314	7,749	1,567	9,002	6,822	2,180
35.	Building (excluding farm)	3,800	154	3,954	1,254	5,054	4,641	413
36.	Residential	2,200	154	2,354	1,254	3,454	3,454	...
37.	Home owners, owners of rented property	2,200	...	2,200	16/1,100	3,300	17/3,300	...
38.	Tenant	...	154	154	18/ 154	154	154	...
39.	Nonresidential	1,600	...	1,600	...	1,600	1,187	413

Table B-2. Revisions of current construction expenditure series incorporated into interindustry relations study, by type of activity and ownership, 1947 - continued

(In millions)

	Construction activity	Current Commerce-Labor series 1/	First order additions	Revisions total 2/	Final revisions		Distribution by ownership	
					Additions	Total	Private	Public
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Maintenance and repair - continued							
40.	Farm	$ 682	$ 89	$ 771	$ -133	$ 549	$ 549	...
41.	Operators' dwellings	425	17	442	8/ -233	192	192	...
42.	Service buildings	257	72	329	8/ 90	347	347	...
43.	Land betterment	...	...	...	9/ 10	10	10	...
44.	Public utility	1,582	64	1,646	74	1,656	1,632	$ 24
45.	Railroad	1,072	46	1,118	10/ 46	1,118	1,118	...
46.	Local transit	46	24	70	19/ 24	70	46	24
47.	Petroleum pipeline	37	-6	31	20/ -6	31	31	...
48.	Electric light and power	162	...	162	21/ 10	172	172	...
49.	Gas	87	...	87	...	87	87	...
50.	Telephone	157	...	157	...	157	157	...
51.	Telegraph	21	...	21	...	21	21	...
52.	Highways, roads, and streets	1,141	7	1,148	22/ 7	1,148	...	1,148
53.	Sewer and water	135	...	135	...	135	...	135
54.	Sewage disposal	35	...	35	...	35	...	35
55.	Water supply	100	...	100	...	100	...	100
56.	Conservation and development	95	...	95	23/ 140	235	...	235
57.	Corps of Engineers	95	...	95	15	110	...	110
58.	River and harbor	95	...	95	...	95	...	95
59.	Flood control	...	...	...	15	15	...	15
60.	Other Federal	...	...	...	40	40	...	40
61.	Non-Federal public	...	...	...	24/ 75	75	...	75
62.	Parks and playgrounds	...	...	...	10	10	...	10
63.	Military and naval	...	...	...	25/ 175	175	...	175
64.	Miscellaneous public service enterprises	...	...	...	26/ 50	50	...	50

Notes to Table B-2

1/ This is based upon the expenditure series published in Construction and Building Materials, Statistical Supplement, May 1951, U. S. Department of Commerce, National Production Authority, Facilities and Construction Bureau, Building Materials Division. The issue of May 1952, released after this report had been completed, included some minor revisions which did not affect the analysis.

2/ Revisions and additions incorporated into the interindustry analysis of construction as of August 1951.

3/ Based upon reexamination of source material and techniques for conversion to value-in-place. (See Appendix A-1.)

4/ Includes driveways, walks, fences, patios, etc., not included in the residential permit valuation and usually constructed subsequent to the completion of the structure. Expenditure estimated on basis of estimated average expenditure for this activity per unit.

5/ Based upon Census of Manufactures, 1947, data. (See p. 11 .)

6/ Based upon revision of original assumption of volume of undercoverage. (See p. 12 .)

7/ Based upon additional data obtained from Bureau of Labor Statistics sources indicating undercoverage in F. W. Dodge data.

8/ Estimated from recent revisions of aggregate construction expenditures (new and maintenance) prepared by Bureau of Agricultural Economics, U. S. Department of Agriculture, and based upon 1950 Farm Housing and Other Farm Buildings survey.

9/ Expenditures for irrigation, drainage, deep wells, etc., estimated in cooperation with Bureau of Production and Marketing, U. S. Department of Agriculture.

10/ Based upon more detailed analysis of railroad industry system of accounts.

11/ Represents transfer of public local transit funds from Commerce-Labor "miscellaneous public service enterprise" category. For interindustry analysis, local transit was treated as a single unit regardless of source of funds or ownership.

12/ Private sewer and water expenditures, respectively $1 million and $32 million, were transferred from the Commerce-Labor "all other" private category.

13/ Based upon consultation with technicians in Public Health Service and Defense Production Administration on understatement of force account construction in this area.

14/ Adjustment for land and right-of-way costs.

15/ Based upon survey made in cooperation with American Association of Oil Well Drilling Contractors.

16/ Based upon Federal Reserve Board study indicating higher levels. (See Appendix A-1.)

17/ Public funds are included in this total, but there is no method of determining the size of this segment.

18/ Based upon data contained in "Family Spending for Housing," Monthly Labor Review, October 1949.

19/ Derived as a result of detailed analysis of industry by transportation analyst.

20/ Derived as a result of new method of estimating expenditures. (Revised Commerce estimate is $33 million.)

Notes to Table B-2 - continued

21/ Estimated expenditure by rural electrification cooperatives.

22/ Difference in computation from same sources.

23/ Based upon published data and judgment estimates.

24/ Twenty five million dollars spent by State and local authorities on projects constructed by the Federal Government.

25/ Based upon data obtained from *Progress Report, Section 3-B, Construction, Real Estate, Repairs and Utilities*, Department of the Army.

26/ Based upon analysis of total value-in-place and estimated percent cost for maintenance and repair.

Table B-3. Distribution of total inputs for new and maintenance construction in producer and purchaser values, by type of expenditure, 1947

(In thousands of dollars)

Industry	Total construction		New construction		Maintenance and repair	
	Producer's value	Purchaser's value	Producer's value	Purchaser's value	Producer's value	Purchaser's value
Total expenditures	28,704,033	28,704,033	19,702,093	19,702,093	9,001,940	9,001,940
A. Cost of materials, fuels, electricity, and marketing charges	15,228,556	15,228,556	10,502,474	10,502,474	4,726,082	4,726,082
1. Cost of materials, parts, containers, and supplies	11,369,462	15,192,206	8,000,577	10,478,679	3,368,885	4,713,527
(I-O)						
17 Greenhouse and nursery products	92,014	98,005	56,871	60,472	35,143	37,533
1310 Crude petroleum and natural gas	8,242	8,242	8,242	8,242	...	...
1410 Dimension stone	21,000	31,521	14,703	22,058	6,297	9,463
1420 Crushed and broken stone	60,220	131,713	42,143	92,175	18,077	39,538
1422 Crushed and broken limestone	86,073	162,831	59,378	112,360	26,695	50,471
1441 Sand and gravel	130,070	319,459	93,734	227,238	36,336	92,221
1450 Clay, ceramic, and refractory material	4,092	10,991	4,092	10,991	...	...
3281 Cut stone and stone products	18,000	22,890	16,721	21,264	1,279	1,626
1472 Chemical and fertilizer mineral mining	7,315	15,200	7,315	15,200	...	...
2220 Cotton and rayon textiles	3,161	3,482	2,910	3,206	251	276
2274 Hard surface floor covering	31,249	61,539	25,058	49,347	6,191	12,192
2291 Felt goods, n.e.c.	4,469	7,115	3,328	5,295	1,141	1,820
2295 Coated fabrics	5,124	6,361	1,318	1,636	3,806	4,725
2297 Jute and cordage	3,150	4,700	2,994	4,468	156	232
2394 Canvas products	662	1,000	464	700	198	300
2411 Logging	14,555	31,072	6,226	13,315	8,329	17,757
2421 Sawmills and planing mills	1,317,013	2,161,229	1,087,424	1,750,150	229,589	411,079
2423 Shingle mills	48,895	72,621	23,303	32,722	25,592	39,899
2431 Millwork plants	447,269	635,096	401,336	561,609	45,933	73,487
2432 Plywood plants	84,624	131,119	56,448	84,100	28,176	47,019

Table B-3. Distribution of total inputs for new and maintenance construction in producer and purchaser values, by type of expenditure, 1947 – continued

(In thousands of dollars)

Industry	Total construction		New construction		Maintenance and repair	
	Producer's value	Purchaser's value	Producer's value	Purchaser's value	Producer's value	Purchaser's value
A.1. Cost of materials, parts, containers, and supplies – continued						
(I-O)						
2433 Prefabricated wood products	100,009	120,561	95,191	114,754	4,818	5,807
2491 Wood preserving	287,235	317,481	121,407	134,204	165,828	183,277
2499 Wood products, n.e.c.	12,000	19,875	3,615	5,988	8,385	13,887
2510 Wood household furniture	39,327	53,198	37,114	50,204	2,213	2,994
2514 Metal household furniture	77,013	103,204	72,598	97,286	4,415	5,918
2561 Window and door screens	81,306	103,455	30,958	36,882	50,348	66,573
2612 Paper and paperboard mills	92,177	130,168	61,543	84,140	30,634	46,028
2640 Paper products	78,009	128,471	27,777	40,706	50,232	87,765
2819 Inorganic chemicals	7,613	8,260	3,140	3,396	4,473	4,864
2826 Explosives	16,146	16,952	16,146	16,952	...	...
2851 Paints, varnishes, etc.	580,000	846,374	127,493	166,724	452,507	679,650
2862 Softwood distillation and gum naval stores	6,410	9,568	1,332	1,993	5,078	7,575
2865 Natural dyeing and tanning materials..	3,802	4,513	3,802	4,513	...	...
2882 Linseed oil mills	11,000	13,637	2,292	2,841	8,708	10,796
2899 Chemical products, n.e.c.	4,105	7,050	1,947	3,052	2,158	3,998
2911 Petroleum refining	193,298	310,722	118,854	185,786	74,444	124,936
2932 Coke and byproducts	27,710	32,729	19,344	22,848	8,366	9,881
2951 Paving mixtures	56,467	61,459	33,915	36,913	22,552	24,546
2952 Roofing felts and coating	319,983	481,917	112,135	163,841	207,848	318,076
3011 Tires and inner tubes	42,895	62,132	32,059	46,428	10,836	15,704
3099 Rubber products, n.e.c.	13,146	18,691	11,767	16,731	1,379	1,960
3211 Flat glass and glass products	90,778	188,823	62,215	122,186	28,563	66,637
3229 Pressed and blown glassware	8,260	17,399	6,916	14,566	1,344	2,833
3241 Cement, hydraulic	318,357	457,045	281,883	399,894	36,474	57,151
3250 Structural clay products	246,725	310,240	230,297	289,580	16,428	20,660
3260 Pottery and related products	100,022	140,696	70,718	97,137	29,304	43,559

Table B-3. Distribution of total inputs for new and maintenance construction in producer and purchaser values, by type of expenditure, 1947 – continued

(In thousands of dollars)

Industry	Total construction		New construction		Maintenance and repair	
	Producer's value	Purchaser's value	Producer's value	Purchaser's value	Producer's value	Purchaser's value
A. 1. Cost of materials, parts, containers, and supplies – continued						
(I-0)						
3271 Concrete products	306,509	376,929	290,315	354,464	16,194	22,465
3272 Gypsum products	117,498	157,535	107,570	144,223	9,928	13,312
3274 Lime	12,177	16,562	11,149	15,164	11,028	1,398
3275 Mineral wool	53,228	84,315	40,512	64,173	12,716	20,142
3291 Abrasive products	1,962	4,942	711	1,790	1,251	3,152
3292 Asbestos products	102,572	149,363	53,046	77,245	49,526	72,118
3293 Gaskets and insulations	17,198	19,300	7,864	8,825	9,334	10,475
3294 Graphite and statuary goods	15,186	24,880	15,186	24,880	...	...
3295 Minerals, ground or treated	8,027	11,914	3,197	4,747	4,830	7,167
3311 Blast furnaces	2,137	2,304	...	...	2,137	2,304
3312 Steel works	708,414	791,981	539,121	602,624	169,293	189,357
3321 Iron foundries	162,567	174,851	127,723	137,374	34,844	37,477
3332 Primary lead	13,217	14,530	8,492	9,336	4,725	5,194
3341 Secondary nonferrous metals	20,140	21,535	12,941	13,838	7,199	7,697
3351 Copper rolling and drawing	198,820	226,612	161,591	183,665	37,229	42,947
3352 Aluminum rolling and drawing	39,609	43,422	24,406	26,831	15,203	16,591
3359 Nonferrous metal rolling	28,375	29,963	19,465	20,547	8,910	9,416
3422 Edge tools	4,107	5,006	1,831	2,232	2,276	2,774
3423 Hand tools, n.e.c.	12,916	15,651	8,678	10,516	4,238	5,135
3425 Hand saws	2,243	2,657	1,721	2,021	522	636
3429 Hardware, n.e.c.	126,883	164,121	101,164	128,294	25,719	35,827
3431 Metal plumbing fixtures	229,601	318,242	118,614	154,658	110,987	163,584
3461 Vitreous-enameled products	2,861	3,207	1,955	2,191	906	1,016
3432 Oil burners	106,698	128,971	40,767	47,383	65,931	81,588
3439 Heating and cooking apparatus	541,692	652,717	229,741	267,449	311,951	385,268
3441 Structural metal products	742,024	788,414	670,034	711,932	71,990	76,482
3442 Metal doors, sash, etc.	158,164	172,035	133,897	144,842	24,267	27,193
3443 Boiler shop products	298,180	315,837	257,300	271,880	40,880	43,957

Table B-3. Distribution of total inputs for new and maintenance construction in producer and purchaser values, by type of expenditure, 1947 – continued

(In thousands of dollars)

Industry	Total construction		New construction		Maintenance and repair	
	Producer's value	Purchaser's value	Producer's value	Purchaser's value	Producer's value	Purchaser's value
A. 1. Cost of materials, parts, containers, and supplies – continued						
(I-O)						
3444 Sheet metal work	297,195	332,856	151,624	165,399	145,571	167,457
3592 Fabricated pipe	75,898	100,000	59,003	76,156	16,895	23,844
3471 Lighting fixtures	168,169	205,110	83,148	97,437	85,021	107,673
3481 Nails and spikes	57,334	74,800	46,831	59,765	10,503	15,035
3489 Wirework, n.e.c.	194,412	246,945	97,041	119,013	97,371	127,932
3494 Bolts, nuts, washers, etc.	22,479	30,761	15,091	19,914	7,388	10,847
3499 Fabricated metal products	59,049	59,935	34,030	34,540	25,019	25,395
3521 Tractors	16,089	17,810	11,264	12,467	4,825	5,343
3531 Construction and mining machinery	50,465	63,568	32,913	41,458	17,552	22,110
3532 Oil-field machinery tools	49,650	58,535	49,650	58,535	...	...
3561 Pumps and compressors	74,314	93,079	52,736	65,870	21,578	27,209
3562 Elevators and escalators	73,287	75,466	69,180	71,237	4,107	4,229
3563 Conveyers	4,302	4,672	4,302	4,672	...	...
3568 Mechanical stokers	26,456	28,279	20,375	21,779	6,081	6,500
3585 Refrigeration machinery	36,544	48,828	36,488	48,752	56	76
3589 Service and household machines	12,750	16,513	10,835	14,033	1,915	2,480
3591 Valves and fittings	72,011	95,831	54,721	74,477	17,290	21,354
3611 Wiring devices	180,190	235,131	139,571	177,273	40,619	57,858
3613 Electrical measuring instruments	2,163	2,231	2,163	2,231	...	...
3614 Motors and generators	3,205	3,537	2,442	2,696	763	841
3615 Transformers	5,935	6,431	5,893	6,387	42	44
3616 Electrical control apparatus	38,048	45,739	33,170	39,875	4,878	5,864
3621 Electrical appliances	28,440	36,955	18,874	24,525	9,566	12,430
3631 Insulated wire and cable	408,657	480,464	361,875	425,462	46,782	55,002
3664 Telephone and telegraph equipment	8,361	8,563	485	496	7,876	8,067
3669 Communication equipment	38,954	43,245	13,612	15,112	25,342	28,133
3691 Storage batteries	3,920	5,140	1,009	1,323	2,911	3,817
9910 Motor vehicle replacement parts	36,076	59,058	28,081	45,993	7,995	13,065

Table B-3. Distribution of total inputs for new and maintenance construction in producer and purchaser values, by type of expenditure, 1947 - continued

(In thousands of dollars)

Industry	Total construction		New construction		Maintenance and repair	
	Producer's value	Purchaser's value	Producer's value	Purchaser's value	Producer's value	Purchaser's value
A. 1. Cost of materials, parts, containers, and supplies - continued						
(I-O)						
3821 Mechanical measuring instruments	20,960	22,260	19,696	20,918	1,264	1,342
3871 Plastics products	15,000	17,749	11,196	13,249	3,804	4,500
3982 Cork products	3,448	4,000	3,448	4,000	...	...
3981 Brooms and brushes	13,000	28,257	3,964	5,220	9,036	23,037
5093.1 Waste material, metal	24,000	24,000	24,000	24,000	...	...
All other materials, n.e.c. 1/..	15,368	18,856	12,873	15,898	2,495	2,958
2. Cost of fuels and purchased electric energy 2/	30,271	36,350	22,461	23,795	7,810	12,555
4911 Electric light and power	25,676	25,676	20,530	20,530	5,146	5,146
1110 Anthracite	135	233	114	196	21	37
1210 Bituminous	3,062	9,043	641	1,893	2,421	7,150
4922 Natural gas transmission and distribution	699	699	588	588	111	111
4925 Manufactured gas production and distribution	699	699	588	588	111	111
3. Marketing charges on material purchases	3,828,823	...	2,479,436	...	1,349,387	...
N167 Railroad transportation	700,266	...	521,849	...	178,417	...
N168 Trucking	469,298	...	338,818	...	130,480	...
N169.1 Warehousing and storage	7,031	...	4,179	...	2,852	...
N171 Other water transportation	35,925	...	25,858	...	10,067	...
N173 Air transportation	181	...	132	...	49	...
N174 Pipe line transportation	659	...	401	...	258	...
N175.1 Wholesale trade	1,314,383	...	826,923	...	487,460	...
N176 Retail trade	1,194,296	...	692,909	...	501,387	...

Table B-3. Distribution of total inputs for new and maintenance construction in producer and purchaser values, by type of expenditure, 1947 – continued

(In thousands of dollars)

Industry	Total construction		New construction		Maintenance and repair	
	Producer's value	Purchaser's value	Producer's value	Purchaser's value	Producer's value	Purchaser's value
A. 3. Marketing charges on material purchases – continued						
(I-O)						
9010 Federal government	68,234	...	45,240	...	22,994	...
1) Transportation excise tax	29,876	...	22,051	...	7,825	...
2) Other excise taxes	38,358	...	23,189	...	15,169	...
9020 State and local government – excise taxes	38,550	...	23,127	...	15,423	...
B. Nonmaterial charges	13,475,477	13,475,477	9,199,619	9,199,619	4,275,858	4,275,858
1. Purchased services	1,553,119	1,553,119	1,294,559	1,294,559	258,560	258,560
N191 Telephone	42,259	48,807	34,644	40,230	7,615	8,577
N192 Telegraph	2,079	2,520	1,696	2,030	383	490
N197.1 Nonlife insurance	400,143	400,143	323,421	323,421	76,722	76,722
N198.2 Nonfarm nonresidential rents	83,543	83,543	69,200	69,200	14,343	14,343
N203 Advertising	34,697	34,697	28,602	28,602	6,095	6,095
N204.3 Business services, n.e.c.	100,000	100,000	79,739	79,739	20,261	20,261
N205 Auto repair services	338,798	338,798	250,965	250,965	87,833	87,833
N206.4 Miscellaneous repair services	150,959	150,959	109,481	109,481	41,478	41,478
N211 Miscellaneous professional services ..	328,836	328,836	328,836	328,836	...	...
N247 Construction maintenance	7,085	7,085	5,951	5,951	1,134	1,134
N168 Trucking 3/	54,789	56,104	54,789	56,104	...	...
N175.1 Wholesale trade 4/	1,627	1,627	...	...	1,627	1,627
Excise taxes on services purchased						
1) 9010 Federal Government	8,192	...	7,141	...	1,051	...
2) 9020 State and local government..	112	...	94	...	18	...

Table B-3. Distribution of total inputs for new and maintenance construction in producer and purchaser values, by type of expenditure, 1947 - continued

(In thousands of dollars)

Industry	Total construction		New construction		Maintenance and repair	
	Producer's value	Purchaser's value	Producer's value	Purchaser's value	Producer's value	Purchaser's value
B. Nonmaterial charges - continued						
2. Factor payments, etc.	11,922,358	11,922,358	7,905,060	7,905,060	4,017,298	4,017,298
(I-O) 9500 Households	11,521,548	11,521,548	7,588,491	7,588,491	3,933,057	3,933,057
Wages and salaries	9,440,381	9,440,381	5,930,640	5,930,640	3,509,741	3,509,741
All other payments to households 5/	2,081,167	2,081,167	1,657,851	1,657,851	423,316	423,316
9010) 9020) Taxes paid 6/	400,810	400,810	316,569	316,569	84,241	84,241

1/ Includes 29 materials and supplies with purchaser's value $1,500 and under.

2/ Fuel oils included in 2911 under materials with all other petroleum products.

3/ For hire trucking purchased by the construction industry; does not enter into the direct cost of materials to purchaser.

4/ Represents estimated trade margin on used materials sold by building material dealers whose major source of income is from sale of new materials.

5/ Includes pension plan payments, profits after taxes, interest paid, depreciation, amortization, travel expenses and other overhead costs.

6/ Includes Federal, and State and local taxes.

Table B-4. Distribution of expenditures for maintenance and repair, by major I-O industry groups, 1947

(In thousands)

I-O industry groups	Title	Expenditure
Total expenditures	....	$ 9,001,940
1-9	Agriculture	233,880
1011-1490	Mining and mineral industries	11,877
2010-3999	Manufacturing	476,263
N167	Railroads	1,118,243
N190.1	Local transit	69,533
N174	Pipeline transportation (oil)	31,164
N168-N173, N190 .	Other transportation and warehousing ...	34,641
N191, N192	Telephone and telegraph	178,000
4911	Electric light and power	172,000
4922, 4925	Natural and manufactured gas production, transmission, and distribution	87,000
N196, N197	Banking, finance, and insurance	31,699
N175, N176	Wholesale and retail trade	181,550
5810	Eating and drinking places	73,073
N198.1	Nonfarm residential rents	3,300,000
N198.2, N198.3 ..	Nonfarm nonresidential rents	162,952
N199.1	Farm dwelling rents	228,000
N199.2	Farm nonresidential rents	87,120
N201, N202	Laundries, dry cleaning, and other personal services	22,797
N208, N209	Motion pictures and other amusements ...	26,217
N210, N211, 8061	Medical, dental, and other professional services, including hospitals	78,475
N212, N213, 8210	Nonprofit institutions, including education	265,301
N205, N206	Auto repair services and garages, and other repair services	19,636
9010	Federal Government	446,541
9020	State and local government	1,489,599
9500	Households	154,000
-	All other	22,379

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BLS Report No. 3

New Nonfarm Residential Construction

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A Segment of Construction Activity in the 1947 Interindustry Relations Study

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

The new Bureau of Labor Statistics Reports series combines in a single sequential numbering system the several special numbering systems previously used on non-periodical mimeographed and multilithed publications not offered for sale by the Superintendent of Documents.

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NEW NONFARM RESIDENTIAL CONSTRUCTION

(I-O N244.1)

Construction Activity No. 1

in the

1947 INTERINDUSTRY RELATIONS STUDY

> The construction expenditures estimates presented herein apply only to the 1947 Interindustry Relations Study, and for this type of construction may differ from the 1947 construction expenditures estimated jointly by the U. S. Departments of Commerce and Labor. The principal reasons for these differences are mentioned in BLS Report No. 2, New and Maintenance Construction, the general report on Construction in the 1947 Interindustry Relations Study. The expenditures figures in the accompanying report are intended for use in interindustry analysis, and are not presented as a replacement of the Commerce-Labor estimates.

BLS Report No. 3
United States Department of Labor
Bureau of Labor Statistics
Washington 25, D. C.
February 1953

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NEW NONFARM RESIDENTIAL CONSTRUCTION*

Construction Activity No. 1 in the 1947 Interindustry Relations Study

Definitions

New nonagricultural housing activity in 1947 as defined for interindustry study purposes included the construction of new housekeeping and nonhousekeeping dwellings, residential additions and alterations, and residential nonstructural improvements.

Housekeeping unit construction covered the erection of new private homes and apartments including prefabricated structures. Also included were all Federally constructed housing under the United States Housing Authority, Federal Public Housing Administration, and the Atomic Energy Commission. Other public housing taken into account was the construction of new dwellings by State and local authorities (with or without Federal aid). [1]

Nonhousekeeping unit construction covered transient hotels, dormitories, tourist courts, and cabins.

Residential additions and alterations pertained to structural changes and other improvements to existing residential buildings including conversions in the number of dwelling units. Conversions of nonresidential structures to residential use also were included.[2]

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* Prepared by Gabriel G. Rudney from a study by David I. Siskind, both of the Bureau's Division of Interindustry Economics. Tables 2 and 3 are from Siskind's study. This is the first of a series of reports covering the entire construction industry as defined by the 1947 Intdrindustry Relations Study. The basic concepts and procedures used are more fully explained in a general methodological report, New and Maintenance Construction (I-O N244), U. S. Department of Labor, Bureau of Labor Statistics, Report No. 2.

[1] Dormitories, nurses' and physicians' residences, and similar facilities at hospitals and institutions were excluded from the Federal segment but included in the nonfederal area, because in the latter case it was possible to estimate such expenditures from available data. Similar structures erected at military and naval installations and at-site of reclamation projects are included in Construction Activities 9 and 12, Military and Naval and Conservation and Development, respectively.

[2] Additions and alterations often include repair work. Any repairs made incidental to additions and alterations are included in the latter activity.

Residential nonbuilding improvements referred to construction of walks, patios, driveways, erection of fences, and similar types of ground improvements at residential sites. Such improvements took place either during the construction process or after completion of residential structures.

Excluded from new residential construction were detached garages built either simultaneously or after completion of dwellings.[3]

Also excluded were new living quarters in warehouses and factory buildings, inasmuch as such quarters (e.g., for watchmen) were incidental to the real use of the buildings and represented a minor portion of total construction cost.

Finally, new seasonal dwellings providing less than minimum facilities for year-round living and movable structures (trailers and houseboats) were also excluded.

Expenditure Levels

Expenditures in 1947 for new nonfarm residential construction totalled $7,008 million for purposes of the Interindustry Relations Study. Expenditures for new housekeeping dwellings were estimated at $5,650 million, of which $5,450 million was for private construction and $200 million was for public construction. These private and public estimates were based on published Bureau of Labor Statistics data [4] which included land development and construction costs and architectural and engineering fees. [5]

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[3] Construction of detached garages are covered by Construction Activity No. 3, All Other Nonresidential Building.

[4] Expenditures for New Construction 1915-50, U. S. Department of Labor, Bureau of Labor Statistics, August 1951, pp. 22-23. Source data were based upon building permit information adjusted for nonpermit issuing areas. Expenditure data on public residential construction were obtained directly from public agencies.

[5] Although not relevant to the input analysis, it is noteworthy that such expenditures did not represent final cost to purchaser. Other cost items were involved such as cost of undeveloped land, equipment cost, speculative or operative builder's profit, settlement charges, etc. For 1947 estimates see BLS Report No. 2, New and Maintenance Construction, by David I. Siskind.

The $200 million total of new public residential construction was distributed as follows: Veterans' Re-use Housing Program, $144 million;[6] New York City Housing Authority, $42 million; Atomic Energy Commission, $9 million; and other local housing authorities, $5 million.

The level of expenditures for nonhousekeeping residential construction was $125 million in 1947, of which $43 million was for hotel construction and $82 million for all other types.[7]

Total expenditures for residential additions and alterations were estimated at $1,183 million in 1947, and reflected a substantial upward adjustment from the published level of $735 million estimated jointly by the United States Departments of Commerce and Labor.[8]

The expenditure level for residential nonstructural improvements was estimated at roughly $50 million.[9]

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[6] Veterans Re-use Housing Program, which accounted for about 70 percent of total public residential construction in 1947, provided for conversion (at-site or dismantling, removal, and erection) of surplus barracks and other vacant temporary building into living quarters for veterans and their families.

[7] Construction and Building Materials, Statistical Supplement, U. S. Department of Commerce, May 1952, p. 6.

[8] The Commerce-Labor estimate was based upon Report of Building Permits Issued (404), Bureau of Labor Statistics, and is shown in Construction and Building Materials, Statistical Supplement, May 1952, p. 6. A special analysis of Commerce-Labor procedures for adjusting permit valuations for understatement and undercoverage in light of expenditures for additions and alterations as shown in the Federal Reserve Board's Survey of Consumer Finances, demonstrated that the $735 million level was considerably understated. See BLS report No. 2, New and Maintenance Construction for a more extensive discussion of the evaluation procedures.

[9] Because no data were available, this estimate represented a conservative approximation reflecting $50 expenditures per dwelling on a million dwellings in 1947.

Distribution of Expenditures

Materials and supplies used in new nonfarm residential construction in 1947, totaling more than $3.7 billion at-site, represented more than half of total construction expenditures (table 1).

Table 1. Distribution of expenditures for new nonfarm residential construction, by major activity, 1947

(millions of dollars)

Item	Total	New dwellings: House-keeping	New dwellings: Nonhouse-keeping	Additions and alterations	Non-structural improvements
Total expenditures ..	7,008	5,650	125	1,183	50
Materials and supplies	3,768	2,938	67	726	37
Nonmaterial costs ...	3,240	2,712	58	457	13
Wage labor (at-site)	1,853	1,546	34	265	8
Wages, salaries, officers' compensation	222	185	4	32	1
Other overhead costs	1,165	981	20	160	4

The total at-site wage bill amounted to more than $1.8 billion, or more than one-fourth of total expenditures. Overhead expenses of about $1.4 million accounted for almost one-fifth of total costs.

The ratio of material use to at-site wage labor was substantially greater in alteration and improvement projects than in the construction of new dwellings because of the large amount of nonpaid labor (e.g., homeowners) engaged in the former activities.

Table 2 presents the detailed distribution of 1947 material expenditures (or inputs) on all residential construction and its major subactivities. A brief summary of input methodology is presented below.

Analysis of Expenditure Distribution

The over-all distribution of material and nonmaterial expenditures for new nonfarm residential construction represented a consolidation of separate studies of housekeeping dwellings, nonhousekeeping dwellings, residential additions and alterations, and residential nonstructural improvements. The analysis of housekeeping dwellings was made separately for the private and public areas.

Housekeeping Dwellings

The type and relative use of material and nonmaterial inputs vary considerably among construction projects, which, in the case of residential construction, range from small single-family homes to large multifamily apartment buildings. Furthermore, relatively few projects within each type group (e.g., single-family homes) have exactly the same characteristics and features. Therefore, materials and labor inputs for each construction project inevitably form a unique pattern in themselves. Ideally, a consolidation of cost breakdowns for each new dwelling in 1947 would have provided the required expenditure distribution for housekeeping dwelling construction. Although cost breakdown data were available in varying detail for some public housing projects, little information was obtainable for private construction. Therefore, the development of a complex procedure for estimating a national distribution of material and nonmaterial expenditures on residential construction was required.

Separate methods were developed for private and public housing areas, and new private housing was further subdivided into single-family dwellings and multifamily construction.[10]

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[10] Two-family structures were included in the single-family segment because, to a large extent, the distribution of inputs to 2-family structures is similar. Multifamily structures cover dwellings with three or more families.

Private single-family dwellings. To reduce the complexity of the analysis of single-family construction, it was assumed that the types of inputs and their relative importance were related largely to only three basic factors: (1) type of structure erected (one-family); (2) type of exterior wall material used (such as masonry and/or wood); and (3) geographic location.

Briefly, the analysis involved the determination of expenditure patterns for specific new single-family dwellings located throughout the Nation, with exterior wall material used as their distinguishing characteristic. These were grouped within U. S. Census regions by type of exterior wall material. They were then aggregated into regional input patterns by using as weights the expenditures for newhomes with each type of wall material. The regional distributions in turn were weighted by the distribution of total single-family construction expenditures among U. S. Census regions. The consolidation of weighted regional distributions produced the national distribution of specific material and nonmaterial expenditures on newprivate single-family dwellings in 1947.

This procedure depended upon basic input pattern data for new homes in many localities, derived from schedules of construction cost comparison surveys conducted in mid-1947 by the field offices of the Federal Housing Administration.[11/] Prices and quantities of materials and installations were given for 63 standard "example" single-family structures (one for each FHA region) representative of FHA-insured homes under construction in their respective regions.

The 63 input distributions were then grouped within U. S. Census regions. To derive aggregate regional distributions it was necessary to weight each example home by its importance in terms of the proportion of total expenditures for single-family construction in each region. The major distinguishing feature of each example type was exterior wall material used, which provided the necessary

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[11/] Construction Cost Comparison Report, 33587R, Federal Housing Administration.

basis for obtaining weights within regions. Estimates of distribution by type of exterior wall material were based on a 1947 Bureau of Labor Statistics survey of new housing characteristics. This survey was conducted in 32 selected urban areas.[12/] Aggregate regional distributions of material and nonmaterial expenditures were obtained following the weighting process.

To obtain the over-all national distribution it was necessary to obtain weights to apply to regional distributions in terms of total expenditures on new one-family homes in each region. Consequently, weights were developed by: (1) conversion of available permit valuation data [13/] into equivalent dwelling units by type of structure (one, two, and multifamily) and by State; (2) determination of average construction cost for single family homes by State, by assuming that the ratios of State averages to a given national average [14/] were the same as the ratio of average State permit valuations for single-family homes to their national average; (3) computation of total expenditures on single-family construction among the States by applying estimated unit volume to derived average construction cost; and (4) grouping of estimated expenditures by U. S. Census regions to obtain the essential weighting factors.

Regional distributions were appropriately weighted and aggregated to derive the national input distribution for new private single-family dwellings.

Private multifamily dwellings. National distribution of material and nonmaterial expenditures for new multifamily construction (3 or more family structures) was assumed to be influenced largely by the type of projects erected regionally and the distribution of total expenditures for multifamily construction among the regions.

[12/] "Characteristics of One-Family Houses Started, 1947", Monthly Labor Review, January 1949, pp. 46-47.

[13/] Division of Construction Statistics, Bureau of Labor Statistics, U. S. Department of Labor.

[14/] Ibid.

The basic data on specific multifamily structures were obtained from cost breakdowns on 17 FHA-insured garden-type apartment projects erected in 1947 in 13 major areas where such construction was most important.15/ Wherever necessary, individual projects were grouped into U. S. Census regions and their unweighted input patterns combined into regional distributions. As in the single-family analysis described above, it was necessary to obtain weights to apply to the regional distributions in terms of total expenditures on new multifamily projects in each region. The methodology was much the same as in the single-family study. Inasmuch as average construction costs for multifamily dwellings were not available, the relationship between permit valuation and average construction costs for single-family dwellings was used to estimate construction costs by State. After weighting factors were applied to regional distributions, an aggregate national distribution of material and nonmaterial inputs for private multifamily construction was derived.

Public housing. Material and nonmaterial expenditures distributions for public housing were developed separately by specific public programs. Generally, estimates of sample projects were made from cost data provided by public agencies or, if not obtainable, by use of cost data on comparable private projects.

Many project cost schedules16/ were obtained from the Public Housing Administration for determining the input pattern for veterans' re-use housing construction. A cost distribution for a comparable FHA-insured project in New York was used to determine the cost pattern for public housing erected by the New York

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15/ Cost Estimate Worksheet and Tabulation and Summary Forms, Federal Housing Administration. In 1947, relatively few elevator-type apartment buildings were erected. Nevertheless, adjustments were made in the expenditure analyses for materials consumed in these structures.

16/ Construction Cost and Final Revised Estimate Forms, Public Housing Administration.

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Public Housing Authority. In the same manner, inputs for Atomic Energy Commission housing built at Los Alamos, N. M., and Richland, Wash., were estimated from cost data on comparable private housing at Las Vegas, Nev., and Spokane, Wash., respectively.

Finally, input patterns for sample projects provided the basis for distributing respective public program expenditures into specific material and nonmaterial expenditures.

An over-all material and nonmaterial input distribution for all private and public housing then was derived by combining those obtained for private one-family, private multifamily, and public housing.

Nonhousekeeping Dwellings

Detailed expenditure analyses were conducted separately for hotel construction and all other nonhousekeeping dwelling construction.

The major source for development of an input pattern for hotel construction was a 1947 Department of Commerce study of materials consumed per million dollars of hotel construction.[17/] Source data were in quantity terms which required conversion into dollar values by use of both BLS price data and cost data obtained from trade publications. Supplementary input data were obtained from construction cost manuals.[18/]

No input information was available on other types of nonhousekeeping dwelling construction. Because tourist cabin building predominated in this activity, the input distribution derived for new housekeeping dwellings was utilized as

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[17/] "Use of Construction Materials 1947-1948", Construction and Building Materials, U. S. Department of Commerce, August 1948.

[18/] Building Estimator's Reference Book, Walker, R. W: Chicago, Ill., Frank R. Walker Co., 1947; Building Construction Cost Data, Means, R. S.: Duxbury, Mass., Robert Snow Means, 1947; Construction Estimates and Costs, Pulver, H. E.: New York, McGraw-Hill Book Co., 1947.

a base with appropriate adjustments made for considerably fewer installations of such items as plumbing, heating, and other facilities in nonhousekeeping dwellings.

Residential Additions and Alterations

Little is known of either the distribution of expenditures among types of additions and alterations, or the materials consumed. The types of additions and alterations are very extensive - ranging from bathroom installations to the remodeling of apartment houses. Nevertheless, it may be presumed that many material and nonmaterial items used in new housing also are used in additions and alterations.

Therefore, the input distribution derived for new housekeeping dwellings was used as a base for the study of additions and alterations. Rough approximations were made for the differences between the two activities in relative use of particular items.

Residential Nonbuilding Improvements

Although no source data were available on the expenditure distribution for nonstructural improvements, it was possible to identify the general types of nonbuilding improvements, such as fencing and sodding, and their required material and nonmaterial inputs.

Distribution of expenditures for new nonfarm residential construction, 1947

(thousands of dollars)

Item	Total	New dwellings		Additions and alterations	Non-building improvements
		Housekeeping	Non-housekeeping		
Total expenditure	7,008,000	5,650,000	125,000	1,183,000	50,000
Materials and supplies 1/	3,767,747	2,937,869	66,539	725,913	37,426
Greenhouse and nursery products	44,652	28,726	50	4,150	11,726
Stone, sand, and gravel	103,761	84,123	1,427	16,711	1,500
Linoleum and other hard surface floor coverings	36,567	29,722	523	6,322	-
Sawmill and planing mill products	936,238	716,961	13,255	202,917	3,105
Wood shingles	30,288	25,066	492	4,730	-
Millwork	426,071	324,091	6,240	95,740	-
Plywood	69,518	49,310	1,570	18,638	-
Prefabricated wooden buildings and structural members	96,063	83,068	425	12,570	-
Toilet seats	4,643	4,143	100	400	-
Wood household furniture	43,558	38,891	252	4,415	-
Metal household furniture	84,622	77,915	389	6,318	-
Window and door screens, weather-strip, etc.	30,824	26,351	625	3,848	-
Building-paper and building-board	42,654	30,411	590	11,653	-
Wallpaper, laminated wall board, tape	30,594	21,987	450	8,157	-
Paints, varnishes, etc.	97,146	68,524	1,403	27,169	50
Petroleum products	15,525	12,378	207	2,870	70
Coke and byproducts	3,497	2,745	15	737	-
Roofing felts and coatings	57,145	41,778	3,985	11,382	-
Rubber floor covering	3,054	750	529	1,775	-
Flat and pressed glass	51,384	35,646	1,334	14,404	-
Cement, hydraulic	108,958	88,256	1,267	13,435	6,000
Structural clay products	120,802	103,704	3,949	11,249	1,900
Vitreous and semivitreous plumbing fixtures	34,828	25,578	1,313	7,937	-
Concrete products	127,099	108,758	2,919	14,422	1,000
Gypsum products	113,871	91,612	1,655	20,604	-
Lime	9,841	7,867	172	1,802	-
Mineral wool	49,681	31,247	460	17,974	-
Cut-stone and stone products	4,086	3,035	123	428	500
Asbestos products	21,593	14,798	824	5,971	-
Ornamental plaster and statuary products	13,505	10,600	-	2,905	-

Distribution of expenditures for new nonfarm residential construction, 1947 - continued

(thousands of dollars)

Item	Total	New dwellings: House-keeping	New dwellings: Non-house-keeping	Additions and alterations	Non-building improvements
Materials and supplies - continued					
Steel plate, rods, bars, shapes and tubing	31,216	27,221	940	3,055	-
Cast gray-iron pipe and fittings..	31,238	26,742	734	3,762	-
Lead, solder and other nonferrous alloys, n.e.c.	6,146	5,560	110	476	-
Copper sheet, tubing, strip and wire	38,494	30,112	771	7,611	-
Aluminum sheet, wire and tubing ..	4,310	3,456	114	740	-
Nonferrous sheet, strip, wire, tubing, n.e.c.	6,150	4,987	244	919	-
Builders' hardware	73,800	60,895	1,202	11,703	-
Metal plumbing fixtures and supplies	99,881	84,319	1,659	13,903	-
Oil burners	30,167	23,426	627	6,114	-
Heating and cooking apparatus	149,007	124,914	3,207	20,886	-
Structural metal products	62,929	42,444	2,434	14,645	3,406
Metal doors, sash, frame, etc. ...	28,436	19,140	948	8,348	-
Boiler shop products	11,576	9,527	27	2,022	-
Sheet-metal work	38,875	25,518	489	12,868	-
Fabricated pipe and fittings	14,810	12,325	168	2,317	-
Lighting fixtures	31,647	20,958	951	9,738	-
Nails and spikes	27,538	22,502	352	4,669	15
Ferrous and nonferrous wire products	23,316	9,341	540	5,935	7,500
Bolts, nuts, washers, rivets, etc.	2,422	1,758	85	579	-
Pumps and pumping equipment	6,990	6,872	118	-	-
Mechanical stokers	6,919	1,000	-	5,919	-
Refrigerators	26,408	26,408	-	-	-
Valves and fittings	16,384	12,469	600	3,315	-
Wiring devices	36,542	26,776	723	9,043	-
Electrical control apparatus	11,932	9,689	285	1,958	-
Electric ranges	22,498	19,906	115	2,477	-
Insulated wire and cable	56,944	46,163	1,361	9,420	-
Formica and other plastic products	3,089	1,500	250	1,339	-
Tires and inner tubes	9,070	7,626	171	1,234	39
Construction machinery parts	2,344	2,180	47	117	-

Distribution of expenditures for new nonfarm residential construction, 1947 - continued

(thousands of dollars)

Item	Total	New dwellings: Housekeeping	New dwellings: Nonhousekeeping	Additions and alterations	Nonbuilding improvements
Materials and supplies - continued					
Motor vehicle replacement parts...	9,974	8,386	188	1,357	43
Brushes..........................	3,037	2,142	44	849	2
Electric light and power.........	10,000	8,434	151	1,367	48
All other materials and supplies 2/	21,590	15,132	341	5,595	522
Labor and other overhead costs......	3,240,253	2,712,131	58,461	457,087	12,574
Total wages and salaries..........	2,074,832	1,730,710	38,332	297,302	8,488
Wage labor (at site)...........	1,853,414	1,546,147	34,216	265,468	7,583
Wages, salaries, officers' compensation.....................	221,418	184,563	4,116	31,834	905
Other nonmaterial overhead costs 3/	1,165,421	981,421	20,129	159,785	4,086

1/ The order of listing of materials and supplies is similar to that of the Interindustry Classification System. However, a number of Interindustry sectors were aggregated and some titles changed to conform more closely with construction terminology. Identification of materials and supplies by Interindustry sector is presented in Table 3.

2/ Includes miscellaneous material and supply expenditures under $2 million.

3/ Includes profits, repair services, equipment rental, architect and engineering fees, insurance, taxes, interest, depreciation and amortization, telephone, etc.

Table 3

Identification of residential construction materials by interindustry sector

Code 1/	Interindustry Sector	Construction Material
17	Greenhouse and nursery products..	Greenhouse and nursery products
1410	Dimension stone ....)	Stone, sand, and gravel
1420	Crushed and broken stone........)	
1422	Crushed and broken limestone....)	
1441	Sand and gravel.................)	
2274	Hard-surface floor covering.....	Linoleum and other hard-surface floor coverings
2421	Sawmills and planing mills......	Sawmill and planing mill products
2423	Shingle mills...................	Shingles
2431	Millwork plants.................	Millwork
2432	Plywood plants..................	Plywood
2433	Prefabricated wood products.....	Prefabricated wooden buildings and structural members
2499	Wood products, n.e.c.	Toilet seats
2510	Wood household furniture........	Wood household furniture
2514	Metal household furniture.......	Metal household furniture
2561	Window and door screens.........	Window and door screens, weather strip, etc.
2610	Paper and paper-board mills.....	Building paper and building board
2640	Paper products..................	Wallpaper, laminated wallboard, pressed pulp, tape
2851	Paints, varnishes, etc.	Paints, varnishes, etc.
2911	Petroleum refining..............	Petroleum products
2932	Coke and byproducts.............	Coke byproducts
2952	Roofing felts and coatings......	Roofing felts and coatings
3099	Rubber industries, n.e.c.	Rubber floor covering
3211	Flat glass and glass products...)	Flat and pressed glass
3229	Pressed and blown glassware.....)	
3241	Cement, hydraulic...............	Cement, hydraulic
3250	Structural clay products........	Structural clay products
3260	Pottery and related products....	Vitreous and semivitreous plumbing fixtures; porcelain electrical supplies
3271	Concrete products...............	Concrete products
3272	Gypsum products.................	Gypsum products
3274	Lime............................	Lime
3275	Mineral wool....................	Mineral wool
3281	Cut-stone and stone products....	Cut-stone and stone products
3292	Asbestos products...............	Asbestos products
3294	Graphite and statuary goods.....	Ornamental plaster and statuary products
3312	Steel works.....................	Steel plate, rods, bars, shapes and tubing
3321	Iron foundries..................	Cast gray-iron pipe and fittings
3332	Primary lead....................	Lead
3351	Copper rolling and drawing......	Copper sheet, tubing, strip and wire

See footnote at end of table.

Table 3

Identification of residential construction materials by interindustry sector - continued

Code 1/	Interindustry Sector	Construction Material
3352	Aluminum rolling and drawing.....	Aluminum sheet, wire, tubing
3359	Nonferrous metal rolling, n.e.c.	Nonferrous sheet, strip, wire, tubing, n.e.c.
3429	Hardware, n.e.c.	Builders' hardware
3431	Metal plumbing fixtures..........	Metal plumbing fixtures and supplies
3432	Oil burners......................	Oil burners
3439	Heating and cooking apparatus....	Heating and cooking apparatus, n.e.c.
3441	Structural metal products........	Structural metal products
3442	Metal doors, sash, etc.	Metal doors, sash, etc.
3443	Boiler shop products.............	Boiler shop products
3444	Sheet metal work.................	Sheet metal work
3592	Fabricated pipe..................	Fabricated pipe and fittings
3471	Lighting fixtures................	Lighting fixtures
3481	Nails and spikes.................	Nails and spikes
3489	Wirework, n.e.c.	Ferrous and nonferrous wire products
3494	Bolts, nuts, washers, rivets.....	Bolts, nuts, washers, rivets
3561	Pumps and compressors............	Pumps and pumping equipment
3568	Mechanical stokers...............	Mechanical stokers
3585	Refrigeration machinery..........	Refrigerators
3591	Valves and fittings..............	Valves and fittings
3611	Wiring devices...................	Wiring devices
3616	Electrical control apparatus.....	Electrical control apparatus
3621	Electrical appliances............	Electric ranges
3631	Insulated wire and cable.........	Insulated wire and cable
3971	Plastic products.................	Formica and other plastic products
3011	Tires and inner tubes............	Tires and inner tubes
3531	Construction and mining machinery	Construction machinery parts
9910	Motor vehicle replacement parts..	Motor vehicle replacement parts
3981	Brooms and brushes...............	Brushes
4911	Electric light and power.........	Electric light and power

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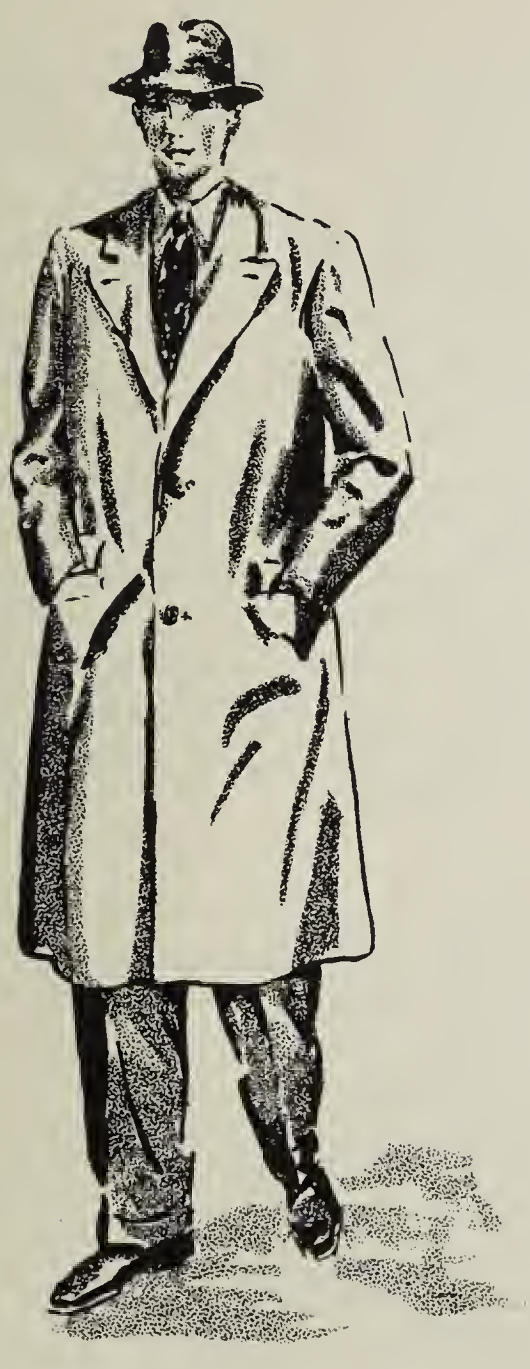
1/ These codes represent the most extensive industrial detail (450-sector basis) of the Interindustry Relations Study. The code numbers are with few exceptions closely related to the Standard Industrial Classification.

BLS Report No. 4

Case study data on
productivity and factory performance...

MEN'S WINTER SUITS AND TOPCOATS



January 1953

STRENGTH FOR THE
FREE WORLD
FROM THE
UNITED STATES OF AMERICA

PREPARED FOR THE MUTUAL SECURITY AGENCY
Productivity and Technical Assistance Division

BY THE UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

Measures to increase the productivity of industrial enterprises and to enlarge the output of goods and services per unit of input have long been recognized as important factors in increasing the standards of living. Exchange of data on industrial productivity and factory performance has proved to be an effective approach toward improved efficiency. Suggestions for improved manufacturing techniques are most useful when they are based on the actual work experience of existing plants, as are the examples presented in this report.

The collection of the data presented in this report has been made possible not only by the cooperation of manufacturers in the United States but also by the advice and assistance of many individuals in the industry, in trade associations, and in labor unions. The men who have contributed their time and technical experience deserve particular appreciation for having made available data on man-hours, output, factory operations, production methods, managerial practices, and machinery, data which represent the results of many years of research and observation.

The term productivity is defined as the ratio between a given quantity of production (output) to one or more of the various "input" factors that are required for such production. As used in this report the input factor concerned is labor, the most important and universal factor and the one that provides the most generally useful common denominator for comparing the efficiency of productive methods and techniques in different units of an industry or between the same industries in different geographic locations.

Low man-hours per unit are the result of many factors, most of which are difficult, if not impossible, to isolate and measure. Inherent differences in the dexterities and abilities of individual workers and in their health and strength affect their production. So may their attitudes, morale, and social purposes. These may be important, but in general the variations in man-hours required per unit among different factories are due primarily to the efficiency and condition of the equipment with which the workers are supplied, the lay-out of the factory which determines the efficiency of the flow of raw materials and goods-in-process, the skill of management in planning and directing production processes, the aggressiveness of management in creating consumer demand and developing effective marketing procedures, the design of the product, and the quality of the raw materials. Highest productivity can never be achieved when one or more of these factors is deficient.

The material in this report constitutes one aspect of the variety of services offered in the Technical Assistance Program.

Case Study Data on
Productivity and Factory Performance

MEN'S WINTER·SUITS AND TOPCOATS

(Based on reports submitted by
10 selected winter suit plants
and 6 selected topcoat plants)

Prepared for

Mutual Security Agency
Productivity and Technical Assistance Division

By

United States Department of Labor
Bureau of Labor Statistics
Washington, D. C.

January 1953

The new Bureau of Labor Statistics Reports series combines in a single sequential numbering system the several special numbering systems previously used on non-periodical mimeographed and multilithed publications not offered for sale by the Superintendent of Documents.

For the convenience of persons who received material regularly under any of the abandoned series, items issued as BLS Reports for a time will also be identified by their former series number.

In addition to the BLS Reports series, the Bureau also issues numbered bulletins, offered for sale by the Superintendent of Documents, and numbered reprints from the Monthly Labor Review.

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Case Study Data on
Productivity and Factory Performance

MEN'S WINTER SUITS AND TOPCOATS

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FOREWORD

The primary objective of this report is to be of use to production managers, superintendents, and methods engineers who are concerned with production problems. It is further hoped that the general discussion of productivity and the presentation of total man-hours per unit in the manufacture of men's winter suits and topcoats will be of interest to government, labor, and trade-association officials. By examining this report plant officials will be able to compare manufacturing operations in their plants with the operations of one or more of the plants in this study. In using this report the following procedure is suggested to production officials:

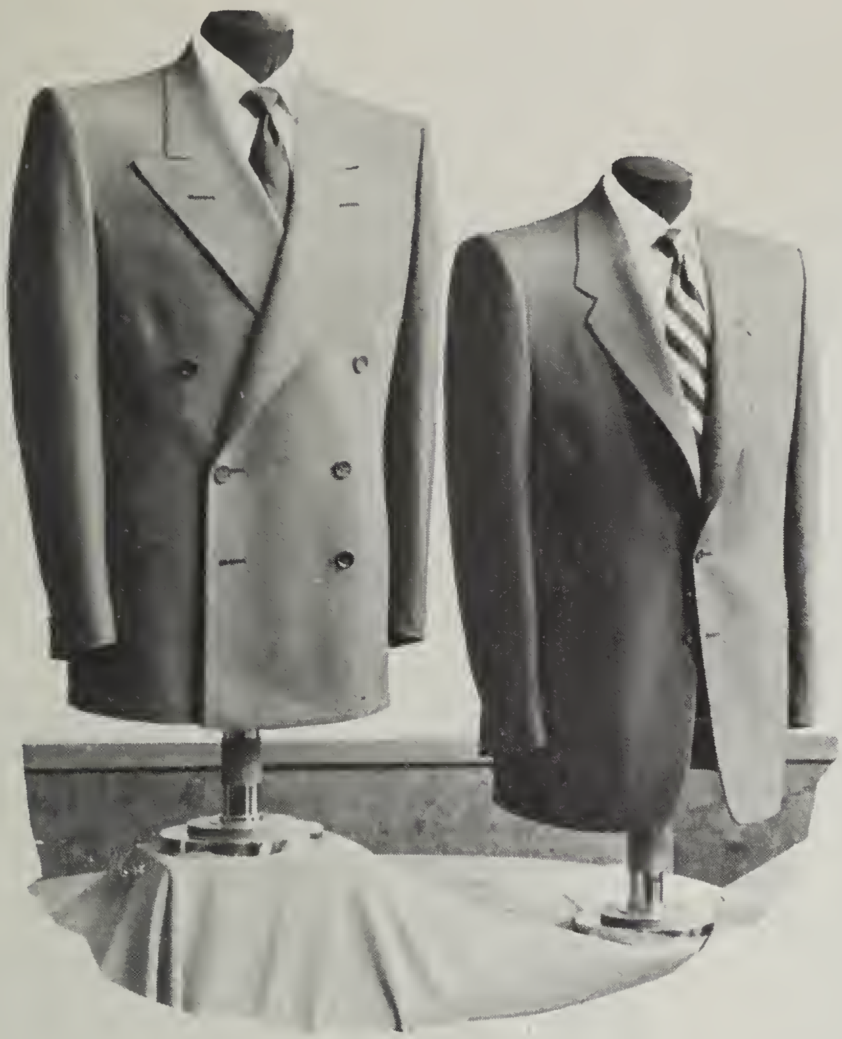
1. Plant officials should refer to tables A through D in chapter I, to identify the United States plants in this study whose employment, production volume, and integration most nearly approach the situation in their plant. For a breakdown of the manufacturing process into machinery used and man-hours for specific operations the official should refer to the tables and text in chapters II, III and IV.

2. The appendix contains a reproduction of the questionnaires used to obtain the information from the United States plants in this study. If the European production official uses these questionnaires to calculate labor requirements for similar operations or groups of operations in his plant he will be able to compare performance in his plant with performance in the plants discussed in this report, and to isolate areas where his plant's performance is relatively good or relatively poor.

3. The European plant official is now ready to compare the American machinery and methods as described in the report with those existing in his own plant, for those problem areas he has isolated. At this point the report does not give him the precise engineering information he may need but it does tell those familiar with the industry the approximate requirements in terms of volume, methods, machinery, and man-power for approaching the productivity levels illustrated in the individual case studies.

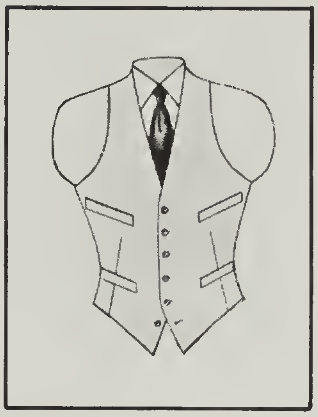
4. For serious problem areas uncovered in this manner, the expert assistance of engineers, either those within his plant or outside consultants, will be needed. For this step intensive study must generally be made in order to correct the conditions found by comparison because these reports do not replace on-the-spot engineers, or other specialists, in the analysis of specific situations.

In summary, this report may be likened to a series of gauges or meters similar in purpose to those which report river levels, pressure in a steam boiler, or a child's temperature. Unlike such meters, which cannot reveal the factors behind the readings, these factory performance studies reveal causes as well as symptoms by giving facts about the technological environment existing at the factories where data were collected. These facts, when acquired by a technician familiar with the industry, can be of material assistance in efforts to correct the conditions indicated by the meter's reading.

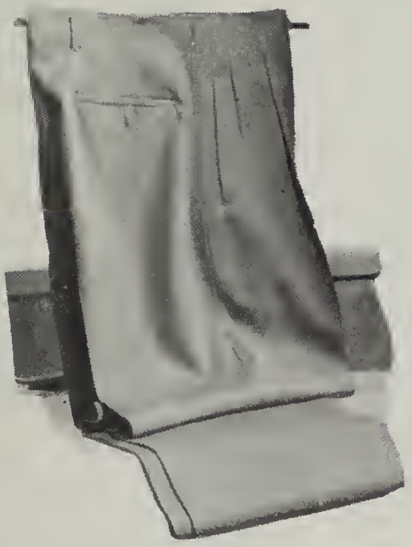


Double Breasted Coat

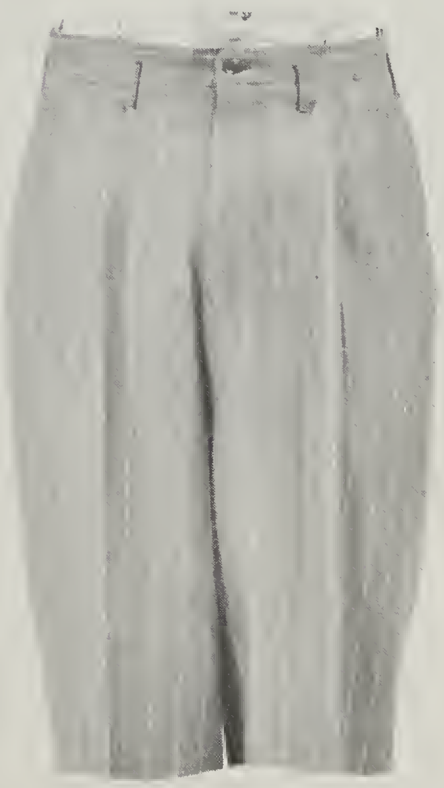
Single Breasted Coat



Vest



Hollywood Waist



Regular Waist Band Trousers

Fig. A Styles of men's winter suits, U.S.A.

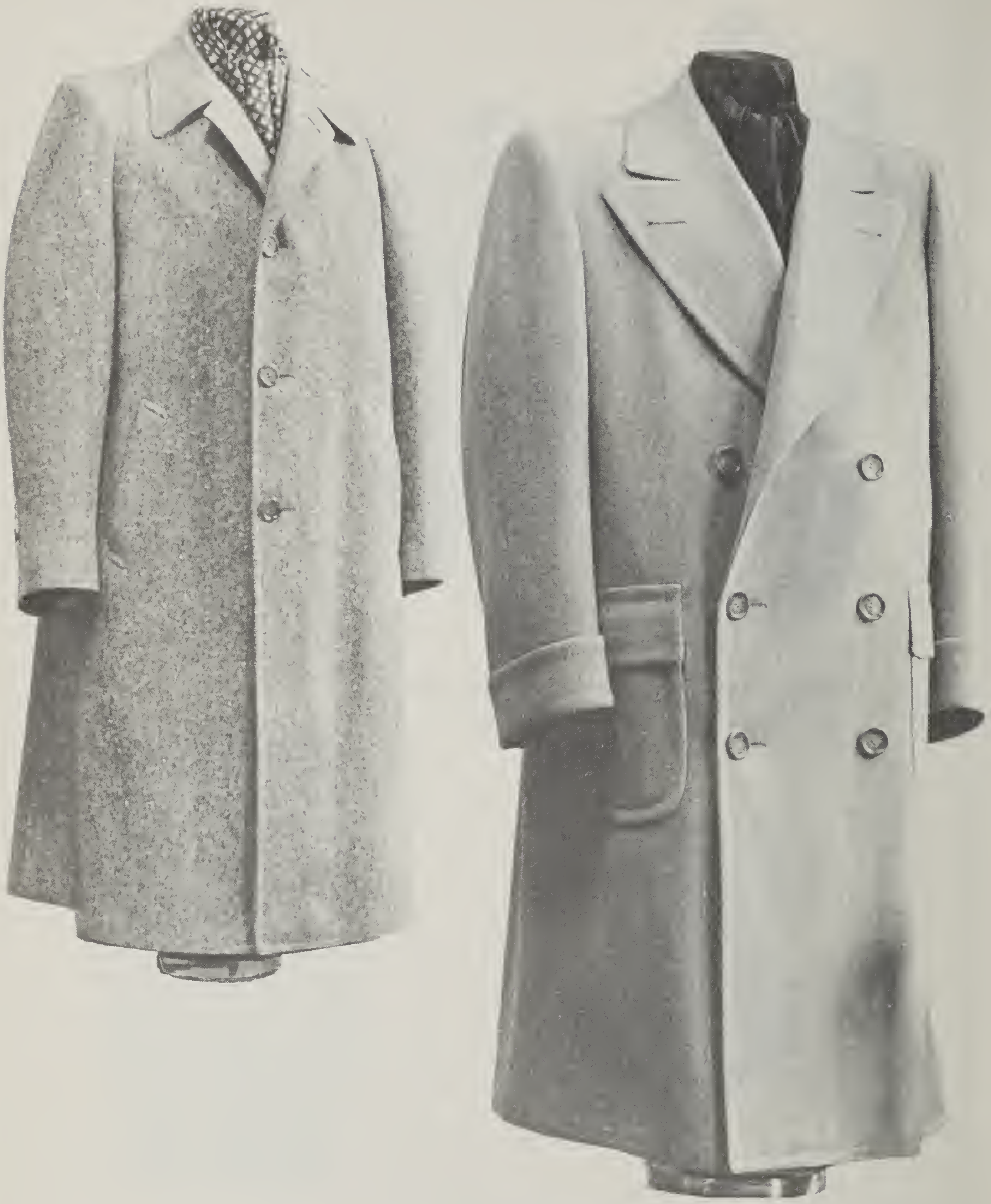


Fig. B Man's single-breasted and double-breasted winter topcoat.

Case Study Data on
Productivity and Factory Performance

MEN'S WINTER SUITS AND TOPCOATS [1/]

CHAPTER I: GENERAL REPORT

High Lights

Men's winter suits and topcoats are sometimes made in the same plant, but usually a manufacturer will specialize and make only one or the other. In this survey, the plants manufacturing men's suits reported that it took from 5 to 9 man-hours to produce a medium quality man's winter suit. Those plants manufacturing topcoats reported that it took from 4 to 7 man-hours to produce a medium quality topcoat. Factors contributing to this high productivity are: the piece rate system, standardization of product, specialization of operations, and progressive manufacturing methods.

Plants in this industry are divided into two broad categories: inside shops which do the majority of the cutting and making operations in their own plant, and contract shops which do cutting or making for other companies. Inside shops may purchase trimmings and other parts cut to size, or contract out a specific making operation such as the hand sewing of buttonholes.

The piece rate system is widely used in the sewing department of plants in this industry, because workers' earnings increase with increased effort once rates have been set by agreement between union and management. The piece rate system, which is a fundamental aspect of wage stabilization achieved through union and management cooperation, has taken wage differentials out of company competition. Competition between firms is now based largely on such factors as materials procurement, production efficiency, and merchandising practices.

Another major factor contributing to high productivity in this industry is the specialization by most firms in the manufacture of one grade of garment with a limited number of models and a set range of sizes. Most manufacturers will not depart from their established line to satisfy individual customer's orders.

Specialization and standardization, made possible by a mass market for the product, are found on the operational as well as the company level. The division of operations into simplified tasks aids workers in attaining a high degree of skill and speed in a short time.

Specialization and standardization are also aided by the practice of booking orders with manufacturers 6 months before the retail selling season. A sufficient supply of capital to carry large stocks of

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1/ Data for men's winter suits were prepared by James W. Wesner, assisted by Frances Perry, and data for men's topcoats were prepared by Seymour Rand. Both are members of the Division of Productivity and Technological Developments, Bureau of Labor Statistics, U. S. Department of Labor.

materials and finished goods, and a plentiful supply of cloth and trimmings, also add to the industry's operating efficiency.

Manufacturing methods in this industry are being constantly improved. Many companies in the past decade have installed sponging, shrinking, and finishing departments. Cloth shrinking and finishing greatly aid the manufacturing process and result in a finished garment of finer appearance.

In the men's suit industry direct labor constitutes 80 to 90 percent of total labor. Efficient servicing of direct operators by indirect workers results in high productivity for the plant.

Machinery maintenance and replacement contribute to high productivity in these plants. Generally, excellent care is taken of plant equipment. In most plants, spare machines and parts are kept in supply. The average age of machinery in the sewing departments is about 10 years.

Basic Production Flow

The production of a garment starts in the designing department. From the designer's ideas sketches are drawn, patterns are cut, and experimental garments are made. The master pattern for the approved model is sent to the grading room where patterns for all sizes are made from carefully worked out proportions.

After the bolts of cloth are received from the mills they are processed through the sponging, shrinking, and finishing department or are sent to a contracting firm specializing in these operations. Although this process varies for different types of cloth, the usual treatment of the cloth is to pass it over a steam trough and immerse it in cold water. It is then dried, pressed, and refinished. This process varies considerably among plants.

A typical work flow for producing men's winter suits is shown in figure C, and for topcoat production in figure D.

Bolts of cloth are requisitioned from the stockroom by the cutting department. The patterns are arranged on a single, smooth layer of the cloth and outlines are traced with chalk. Layers of cloth are then spread on long tables. When the desired number of plys has been laid, the marked material is placed on top and the layers of cloth are cut with a special cutting knife along the chalk outlines. The pieces of the garment are then assembled into bundles, tagged for identification, and sent to the making (sewing) department.

There are three principal operations in the making department: machine sewing, hand sewing, and pressing. Following each series of sewing operations, seams are pressed to make parts retain their shape and thus contribute to a better fitting garment.

Men's Winter Suits

The bundles of parts from the cutting department go to one of three shops in the making department: sack coat, pants, or vest. Within each shop the sewing or making operation is usually sectionalized, i.e., parts such as sleeves, collars, and pockets are made in sections, and joined to the larger parts in a final assembly operation. As the parts move

Table A. Man-hours required to make a man's winter suit in 10 selected plants, U. S. A., 1950

Plant	Grade	Number of workers	Man-hours per suit			Percent indirect to total
			Total	Direct	Indirect	
A	4	450-500	6.547	5.832	0.715	10.9
B	4	250-300	5.921	5.124	.797	13.5
C	4	over 1,000	6.718	6.003	.715	10.6
D	3	over 1,000	5.276	4.606	.670	12.7
E	4	250-300	9.418	7.461	1/ 1.957	20.8
F	2+	500-600	5.904	4.650	1/ 1.254	21.2
G	4+	over 1,000	2/ 6.074	2/ 5.445	2/ .629	10.4
H	5	900-1,000	10.857	8.782	2.075	19.1
I	4	350-400	8.936	8.169	.767	8.6
J	3+	over 1,000	5.075	4.408	.667	13.1

1/ Indirect man-hours could not be allocated to all shops which were serviced by indirect workers.

2/ Man-hours include making department only. Cutting time is not available.

Table B. Man-hours required to make a man's topcoat in 6 selected plants, U.S.A., 1951

Plant	Grade	Unit man-hours				Percent of total		
		Total	Direct	Indirect		Direct	Indirect	
				Departmental	Nondepartmental		Departmental	Nondepartmental
U . .	4	7.157	6.687	0.323	0.147	93.4	4.5	2.1
V . .	3	4.264	3.923	.272	.069	92.0	6.4	1.6
W . .	4	5.255	4.807	.173	.275	91.5	3.3	5.2
X . .	3	4.865	4.475	.250	.140	92.0	5.1	2.9
Y . .	4	5.654	5.131	.455	.068	90.7	8.1	1.2
Z . .	4	6.244	5.394	.417	.433	86.4	6.7	6.9

through the making department, assembly is done on sewing machines and by hand. The variation in the amount of machine and hand work performed determines to a great extent the grade of suit produced, with grades running from 1 to 6, grade 6 being the highest quality and entailing the most hand work. In conjunction with sewing, shaping of the suit is accomplished by steam pressing. When the sack coats, pants, and vests are completed, they are matched and either sent to storage or shipped from an assembly area to the customer. (For a more complete description of the manufacturing process, see chapter II of this report.)

Man-hours of plants B, C, F, and G are for two-piece suits, which are a fashion trend in the United States. Plants A, D, E, H, I, and J reported on three-piece suits (table A).

Direct man-hours are closely associated with the grade of the garment. The basic factor determining this relationship is the progressively larger amount of hand work performed on the garment as the grade increases. The ratio of indirect to total labor for the industry averages about 11 percent for inside shops. The high ratio of indirect labor in plants E and F stems from services rendered in the reporting shops for garments produced in other shops of these firms. Plant H, producing a higher grade garment, provides greater supervision and inspection.

Men's Topcoats

The making department of a topcoat producer has only one shop instead of the two or three in a plant producing men's suits. Topcoats are graded from 1 to 6 on a scale similar to that of men's suits. (For a more complete description of the manufacturing process, see chapter III.)

Direct labor in the men's topcoat industry includes those occupations directly concerned with manufacturing operations such as cutting, sewing, and pressing. Hand sewing increases direct labor requirements (table B). Plants U, W, Y, and Z use more hand sewing because they produce a higher grade garment than plants V and X (table C).

Table C. Man-hour requirements in the cutting and making departments of 6 selected plants in the men's topcoat industry, U.S.A., 1951

Plant	Grade	Man-hours						
		Cutting department			Making department			Nondepartmental
		Total	Direct	Indirect	Total	Direct	Indirect	
U . .	4	0.327	0.284	0.043	6.683	6.403	0.280	0.147
V . .	3	(1/)	(1/)	(1/)	4.195	3.923	.272	.069
W . .	4	(1/)	(1/)	(1/)	4.980	4.807	.173	.275
X . .	3	.277	.238	.039	4.448	4.237	.211	.140
Y . .	4	.549	.378	.171	5.037	4.753	.284	.068
Z . .	4	.386	.244	.142	5.425	5.150	.275	.433

1/ Data not available.

Departmental indirect labor for all plants in the men's garment industry includes such workers as foreman, cutting room clerk, floor boy, and bundle boy. It does not include nondepartmental indirect workers such as general maintenance personnel, receiving and shipping clerk, factory porter, machine repairman, label sewer, final examiner, elevator operator, and guard. The amount of indirect labor used varies with individual plants and is affected by such factors as age and structure of the building, number of work stations, types of materials handling equipment, and extent of quality control.

One indirect worker services several direct workers. Thus, the addition of one indirect worker may increase the productivity of several direct workers. In fact, as manufacturing operations become more standardized the ratio of indirect workers to direct workers increases, resulting in a more efficient use of direct labor.

PRODUCT AND PLANT CHARACTERISTICS: MEN'S WINTER SUITS

The Product

The 10 plants studied produce men's suits, topcoats, overcoats, sport coats, and trousers. The suits studied in this report are two- and three-piece winter suits. The general design of these suits is similar, with major variations appearing in single- and double-breasted models.

Most of the plants studied submitted data on single-breasted sack coats. These coats may have two or three buttons; double-breasted coats usually have two. The amount of drape in the sack coat also varies. Vented backs are the exception in the United States. Pocket arrangement is fairly standard. The customary number and arrangement of pockets are: two side pockets with a change pocket inside the right one, a letter or lining pocket inside the right front, and a welt or handkerchief pocket on the outside left front. Some side pockets are made with flaps.

Production of vests has been decreasing for several years in the United States. Plants A, D, E, H, I, and J include data on vests; the other plants produce mostly two-piece suits. Some plants still including the three-piece model in their line contract work to vest shops.

The most significant difference in suit pants is between models with or without pleats. Usually four pleats are turned toward the pockets; the two inside pleats are larger and are pressed in conjunction with the leg crease. The pants have two side pockets, two hip pockets (one of which is buttoned either with or without a tab), and a watch pocket on the right front just below the waistband. The majority of trousers produced in the United States have zipper flys; only plant E reported on trousers with button flys. Waistbands are made separately with six or seven belt loops. Data for the Hollywood waist style (frontispiece) which has no waistband was reported by plant F. The bottoms of the pants legs are unfinished, but are pinked to prevent raveling and to present a neat appearance to the customer.

Men's suits and coats are graded according to the amount of hand work performed on the garment. Grades 1 and 2 are the low quality group, 3 and 4 the medium quality group, and 5 and 6 the high quality group. Special features of the three qualities of coats and pants are presented in chapter IV. Grade 1 suits are almost entirely machine made, whereas grade 6 suits have a great amount of hand work. The plants studied produce suits with hand sewn shoulders, cuffs, collars, gores, buttonholes, and buttons. (For details on hand sewing operations generally performed in grades 1 to 6, see chapter IV of this report.) The plants in this survey, with the exception of plants F and H, produce medium grade suits.

Worsted fabrics are the most popular suitings used in the United States because of their wearability and crease resistance. Woolen fabrics are also used for suiting, though these are more popular for men's sportswear. The type of trimmings used varies with the grade of suit produced. Coat pocketing is usually silesia, and pants pocketing is made of cotton twill. Coat fronts are made from linen, hair canvas, heavily sized cotton, or burlap, depending on the quality of suit. Body and sleeve linings are rayon. Collar interlinings are linen or sized cotton. In medium and high quality suits, preshrunk linen tape is used for edging lapels and armholes, and cotton for padding shoulders.

Plants and Equipment

The 10 plants surveyed are inside shops; that is, they perform all operations in the manufacture of a suit. Sponging, shrinking, and finishing of cloth are performed in four of the plants and contracted out by the others.

All of the plants are in multistory buildings. The location of departments or shops varies. Usually the office, stockroom, and shipping and receiving departments are on the first or second floor, with other departments on higher floors. Although half the buildings were especially designed for use as men's clothing plants, all but two of the buildings are more than 25 years old. The production area per worker ranges from 100 square feet in plant C to 209 in plant J.

The plants are generally well lighted -- fluorescent lamps are used in all manufacturing departments with the exception of the cutting department of one plant. Most plants report that sewing machines are equipped with individual lights which can be focused directly on the needle to eliminate eyestrain.

Sewing machines are powered by line or unit drive. Three plants use unit drive exclusively; the other seven plants use group or line or a combination of these types of drives. The average age of the machinery for the plants surveyed was 10 years.

Movement of materials within the shops is largely accomplished by hand or by hand-powered wooden or canvas trucks. Freight elevators are used for moving material between floors in all plants studied; three plants use chutes to facilitate movement of materials between floors. A conveyor is used in only one plant, in the receiving room.

PRODUCT AND PLANT CHARACTERISTICS: MEN'S TOPCOATS

The Product

In each of the plants in the survey, the selected topcoat was single-breasted, with two outside slash pockets and one inside pocket. Three of the topcoats had three buttons and three had two buttons. Two of the topcoats were grade 3 and four were grade 4. The factory price ranged from $36 to $42.55 for all topcoats made in these plants. Five of the topcoats were plain gabardine and one was striped herringbone tweed. The weight of the cloth was between 15 and 18 ounces per yard, two-ply, average 57-inches wide. Four of the coats had a medium quality and two had a high quality lining.

The term "model" in the United States topcoat industry refers to the way the topcoat is made; for example, the number of buttons, whether single- or double-breasted, and the number and kind of pockets. The 6 plants in this report produce from 5 to 10 models. Style refers to the type of cloth and its color, textures and finishes. The number of styles ranged from 15 to 250. Sizes ranged from 32 to 54.

Three of the companies retailed their garments under a brand name and two operated their own retail outlets. Three of the companies said they would not alter their product line to satisfy individual customer orders, two said they would, and one makes coats from parts sent to him by the manufacturer.

Plants and Equipment

All the plants except W and Z are firms operating an individual plant. Plant W is one of two plants operated by one company, and plant Z is one of four plants operated by one company.

Most plants either purchased or contracted out coat fronts, shoulder pads, bridle stays, tapes, and other trimmings, but all plants made their own buttonholes, either by machine or by hand.

Hand trucks and rolling racks are the general intradepartmental materials handling devices used to transport parts, bolts of cloth, and coats throughout the plant. Freight elevators are used in plants located in multistory buildings.

All plants use fluorescent lighting for plant illumination, with incandescent lamps on individual sewing machines. All of the plants except W are in buildings over 35 years of age which were not designed primarily for the manufacture of men's topcoats. The plant area of the surveyed plants is utilized as follows: about 70 percent for production, 24 percent for storage, and about 6 percent for office and other use. A summary of other plant characteristics is shown in table D.

CHARACTERISTICS OF MAJOR DEPARTMENTS:

Men's Winter Suit and Topcoat Plants

Sponging, shrinking, and finishing are the first operations performed in the manufacture of men's suits and topcoats. Most plants subcontract this work to a firm specializing in these operations.

The plants performing the above operations use the cold-water method of sponging. Three of these plants use an additional process steam shrinking, for soft goods.

The workers in this department are paid on a time basis. The output per worker for an 8-hour day ranges from 437 to 600 yards for the plants studied.

This department usually has a well-lighted area for inspection.

Table D. Direct man-hour requirements and characteristics of the cutting and making departments of 10 selected plants in the men's winter suit industry, U.S.A., 1950

Plant	Grade	Direct man-hours per suit			Method and number of ply cut [1]	Production method
		Total	Cutting department	Making department		
A . . .	4	5.832	0.455	5.377	M-12	Bundle
B . . .	4	[2] 5.124	.417	4.707	M-25	Bundle
C . . .	4	[2] 6.003	.498	5.505	M-1 to 40 H-1 or 2	Progressive bundle
D . . .	3	4.606	.338	4.268	M-15	Progressive bundle
E . . .	4	7.461	.462	6.999	M-3 to 30	Bundle
F . . .	2+	[2] 4.650	.358	4.292	M-3 to 30	Bundle
G . . .	4+	(3)	(3)	[2] 5.445	H-1 M-30	Progressive bundle
H . . .	5	8.782	1.220	7.562	M-50 H-2	Combination
I . . .	4	8.169	.421	7.748	M-28	Bundle
J . . .	3+	4.408	.315	4.093	M-40	Combination

[1] M - Machine, H - Hand.

[2] Man-hours shown are for a 2-piece suit.

[3] Data not available.

The machinery and equipment used are mostly custom made and require a large floor area because of their bulk and the space requirements of the drying process.

The cutting department is an integral part of all inside plants. About seven operations are usually performed in this department, the most important of which are spreading, marking, and cutting. For the quality of garments made by the reporting companies, spreading is done predominantly by hand-operated spreading machines. Some plants spread plaids, checks, singles, and special orders by hand, and other piece goods and lining by machine.

Cutting tables vary greatly in length, ranging from 4 to 108 feet in the plants studied. The average length is about 50 feet.

Cutting is done predominantly by machine. Some of the plants, however, cut suit or topcoat fabrics by hand scissors as well as by machine. Suit and topcoat fabrics cut by machine ranged from 1- to 50-ply and averaged about 25-ply. Cutting by hand was limited to one- or two-ply. Body lining, canvas fronts, sleeve lining, and pocket lining are cut predominantly by machine. Canvas for coat fronts is purchased by some plants. All workers in the cutting department are on time rates. The reporting plants all use patterns exclusively for marking lays.

The making department of the men's winter suit plants studied is divided into three sections: sack coat, pants, and vest shops. The number of operations average 109 for sack coats, 47 for pants, and 36 for vests. Five plants reported using the bundle system of production, three the progressive bundle, and two the combination system.

In the making department of the men's topcoat plants there is only one shop. The number of operations range from 75 to 182 depending on type model garment being made. Four plants use the bundle method of production, one the progressive bundle, and one the line method. Practically all the direct workers in this department are paid on a piece-rate basis.

Operations Illustrated

In the following section many of the different operations necessary to manufacture men's suits and topcoats are illustrated. The pictures were not all taken in the plants covered in this report.

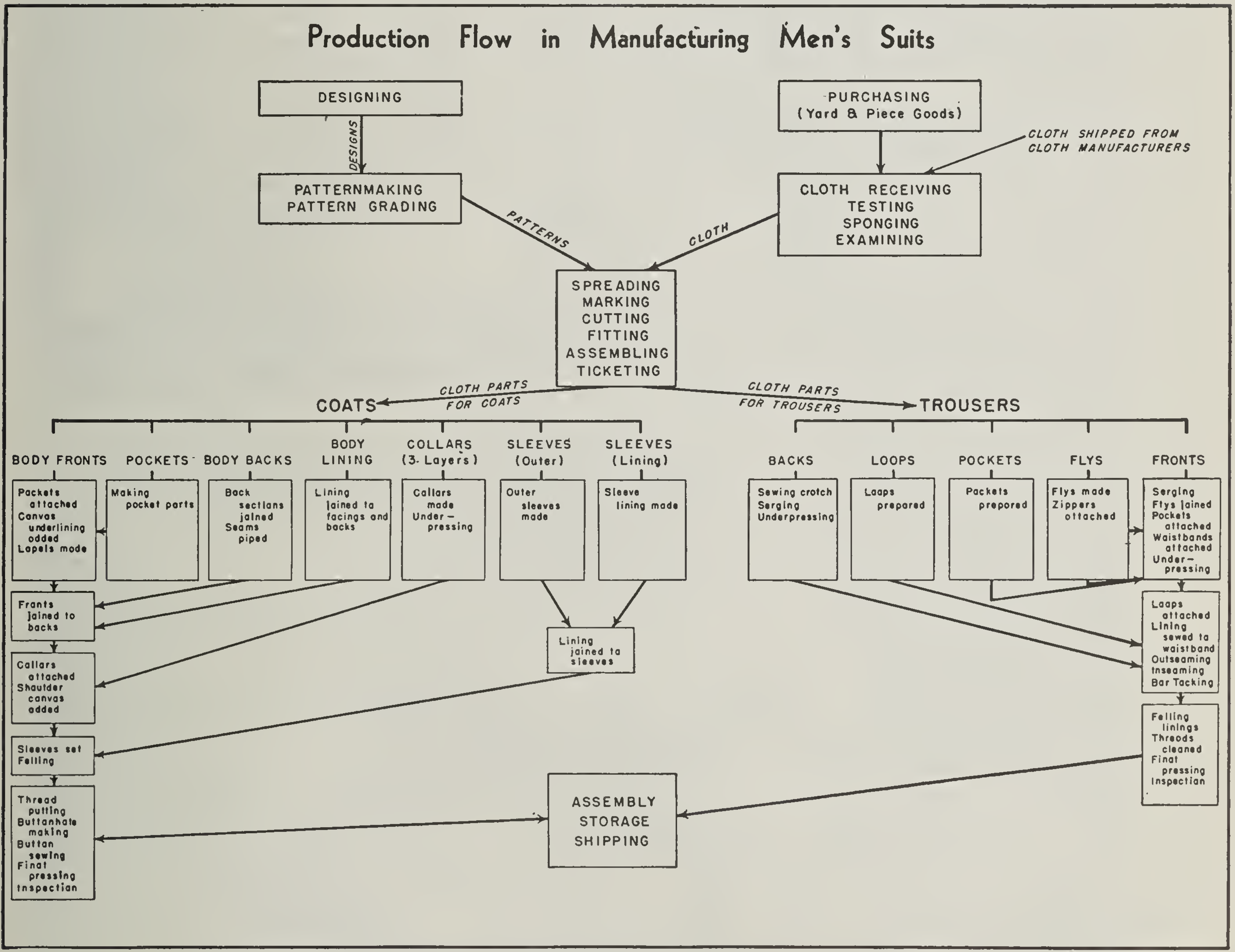
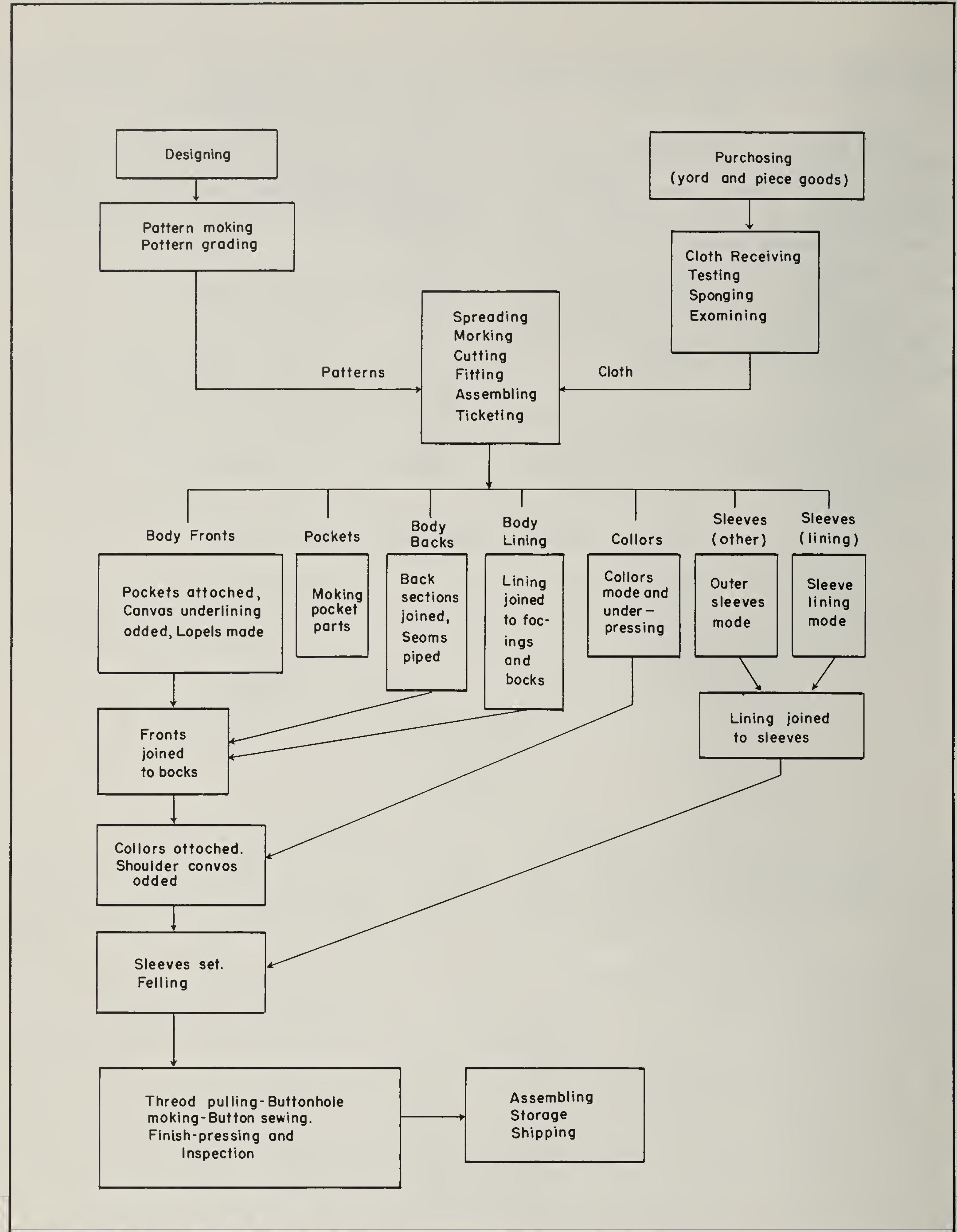

Production Flow in Manufacturing Men's Suits
DESIGNING
DESIGNS
PATTERNMAKING
PATTERN GRADING
PURCHASING (Yard & Piece Goods)
CLOTH SHIPPED FROM CLOTH MANUFACTURERS
CLOTH RECEIVING
TESTING
SPONGING
EXAMINING
PATTERNS
CLOTH
SPREADING
MARKING
CUTTING
FITTING
ASSEMBLING
TICKETING
CLOTH PARTS FOR COATS
CLOTH PARTS FOR TROUSERS
COATS
TROUSERS
BODY FRONTS
POCKETS
BODY BACKS
BODY LINING
COLLARS (3-Layers)
SLEEVES (Outer)
SLEEVES (Lining)
Pockets attached Canvas underlining added Lapels made
Making pocket parts
Back sections joined Seams piped
Lining joined to facings and backs
Collars made Under-pressing
Outer sleeves made
Sleeve lining made
Fronts joined to backs
Collars attached Shoulder canvas added
Sleeves set Felling
Thread pulling Buttonhole making Button sewing Final pressing Inspection
Lining joined to sleeves
BACKS
LOOPS
POCKETS
FLYS
FRONTS
Sewing crotch Serging Underpressing
Loops prepared
Pockets prepared
Flys made Zippers attached
Serging Flys joined Pockets attached Waistbands attached Under-pressing
Loops attached Lining sewed to waistband Outseaming Inseaming Bar Tacking
Felling linings Threads cleaned Final pressing Inspection
ASSEMBLY
STORAGE
SHIPPING

Fig. C Production flow in manufacturing men's suits.



UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

Fig. D Production flow in manufacturing men's topcoats.

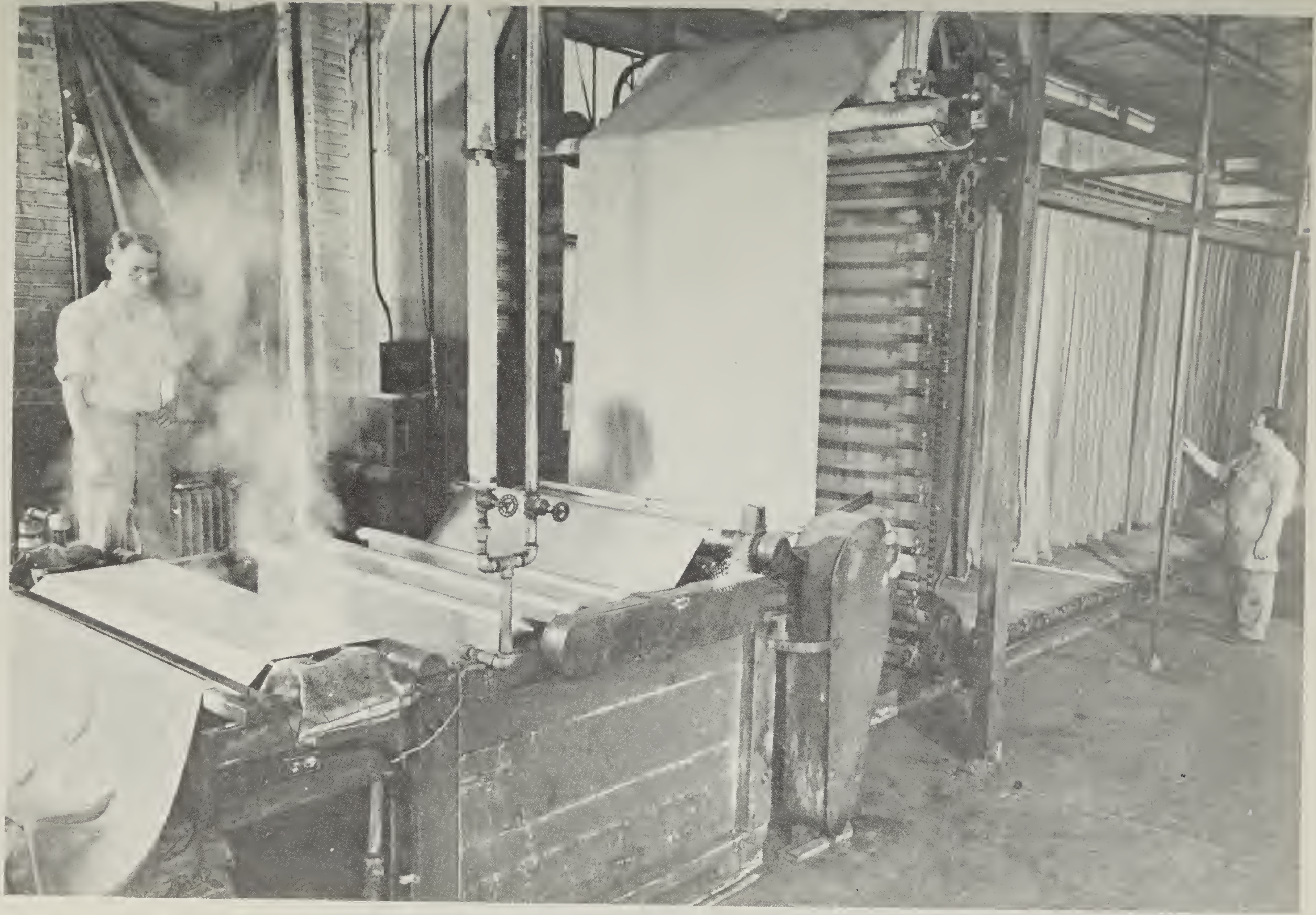


Fig. E Cold water shrinking and drying.

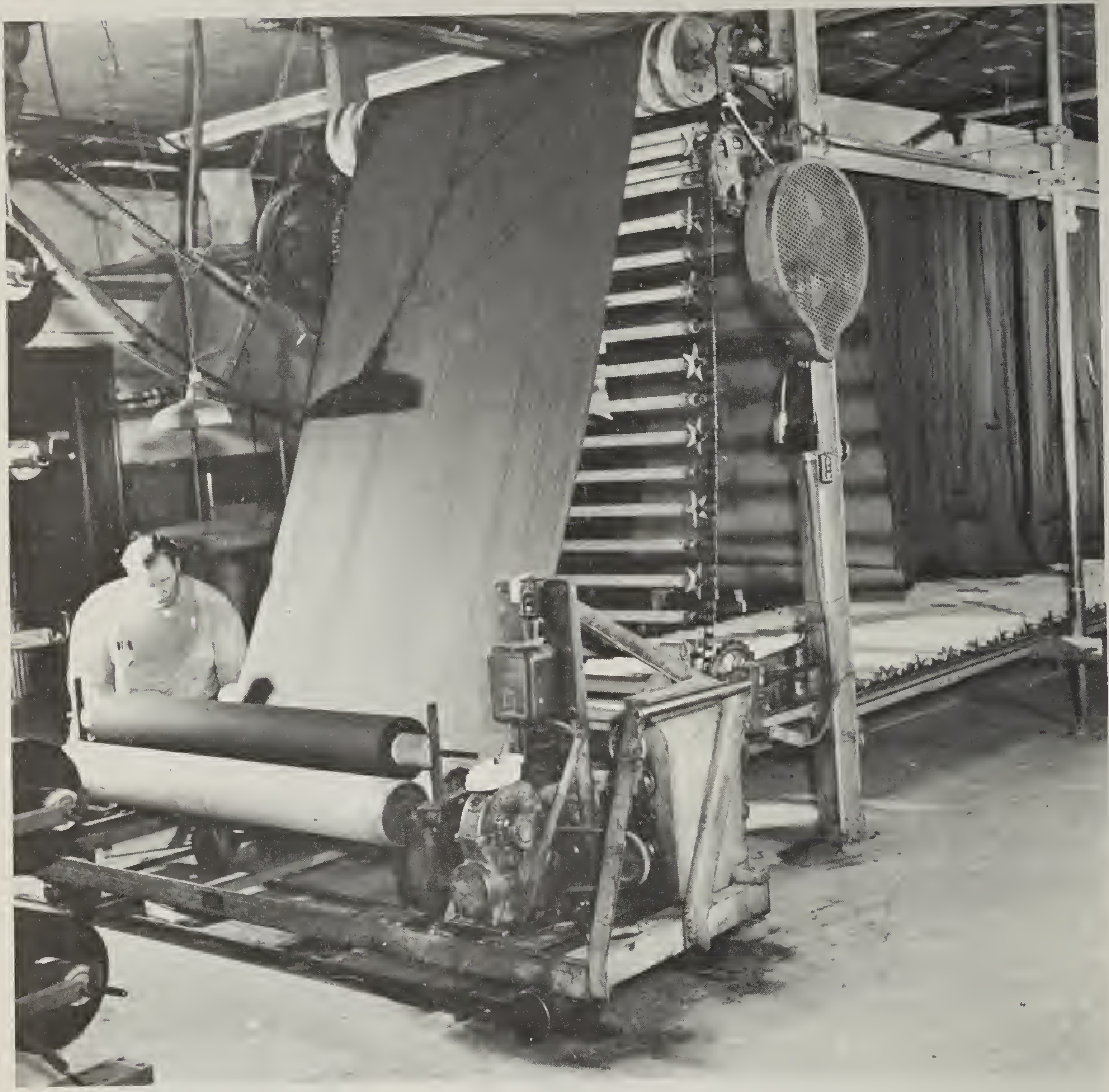


Fig. F Winding cloth after drying.

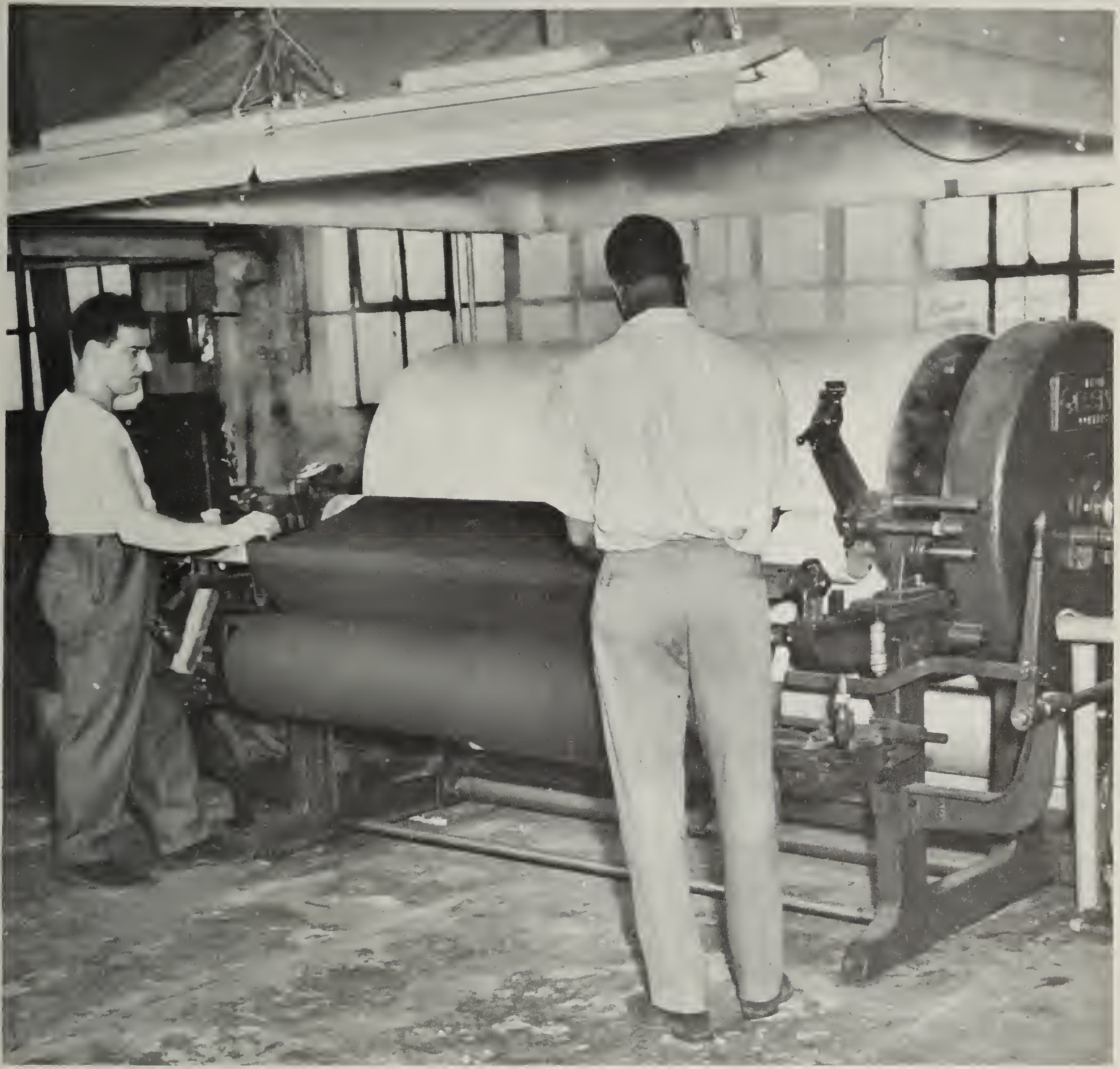


Fig. G Steam drum used in sponging process for shrinking cloth.

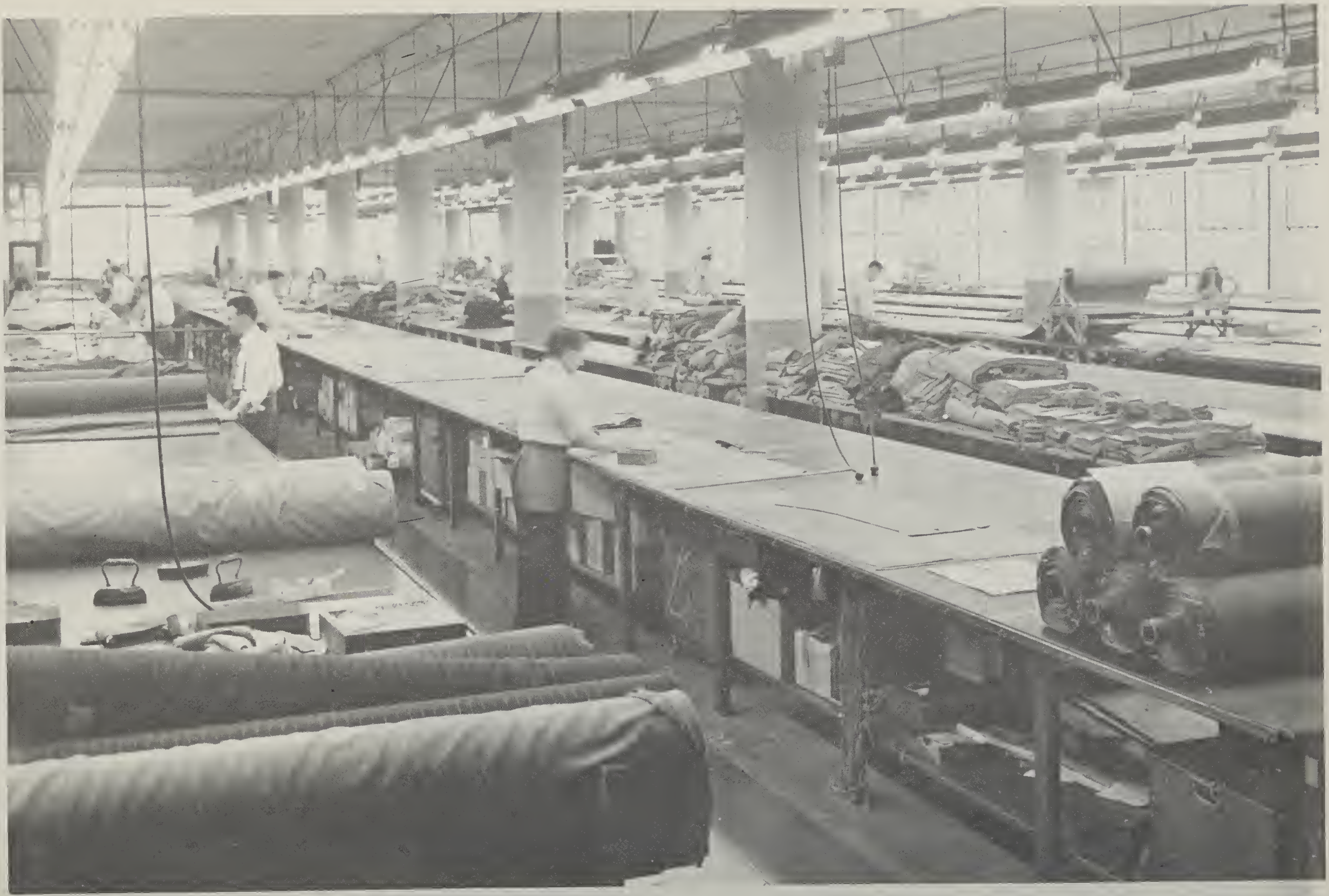


Fig. H Cutting room. Worker in center is marking patterns and lay of two ply, to be cut with hand shears. Hand-operated cloth spreading machine, right background. Cutting machines can be connected to cords attached to overhead electric rails.

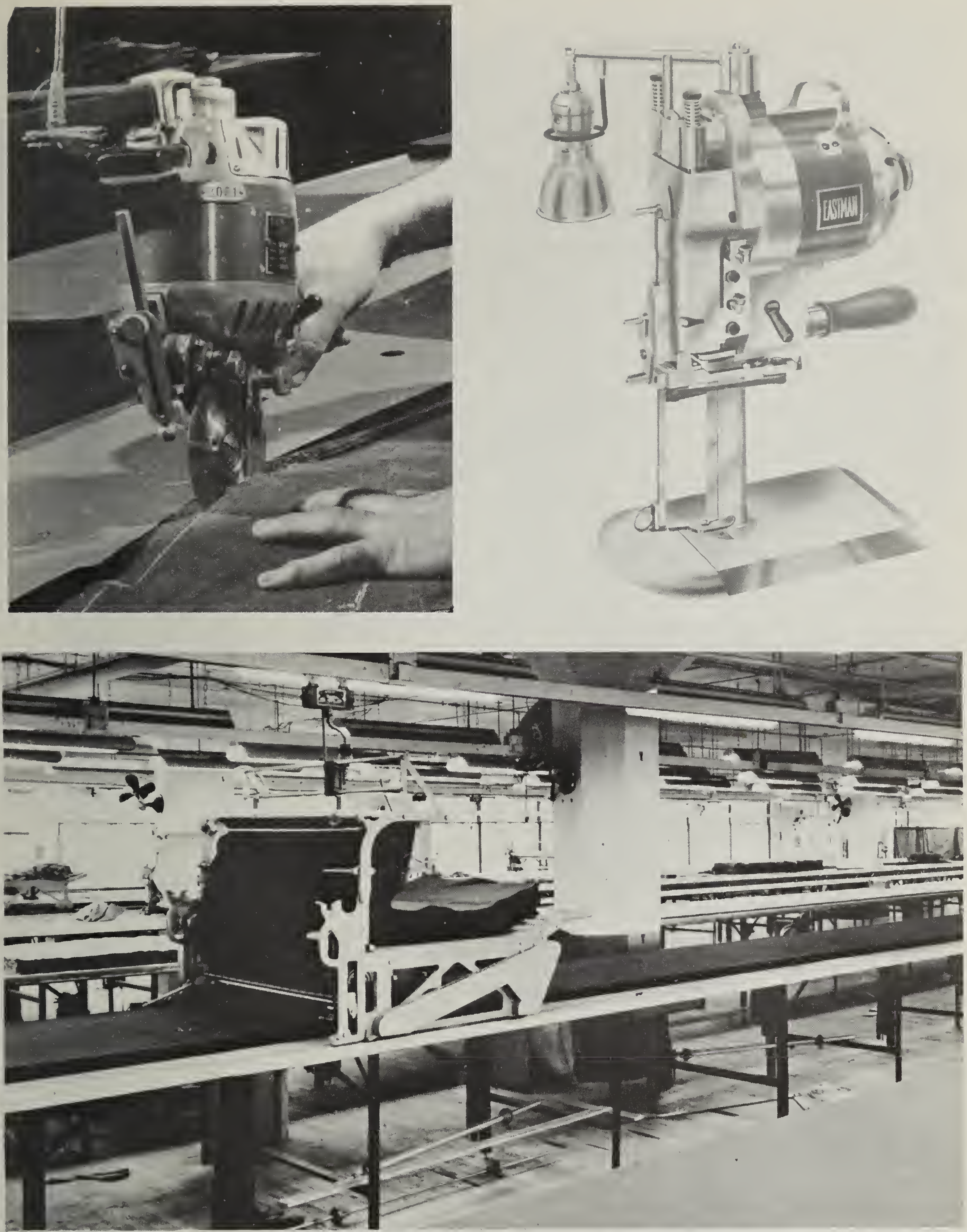


Fig. I Cutting department equipment. Above, electrically operated cloth spreading machine; upper left, round knife cutting machine; upper right, straight knife cutting machine.

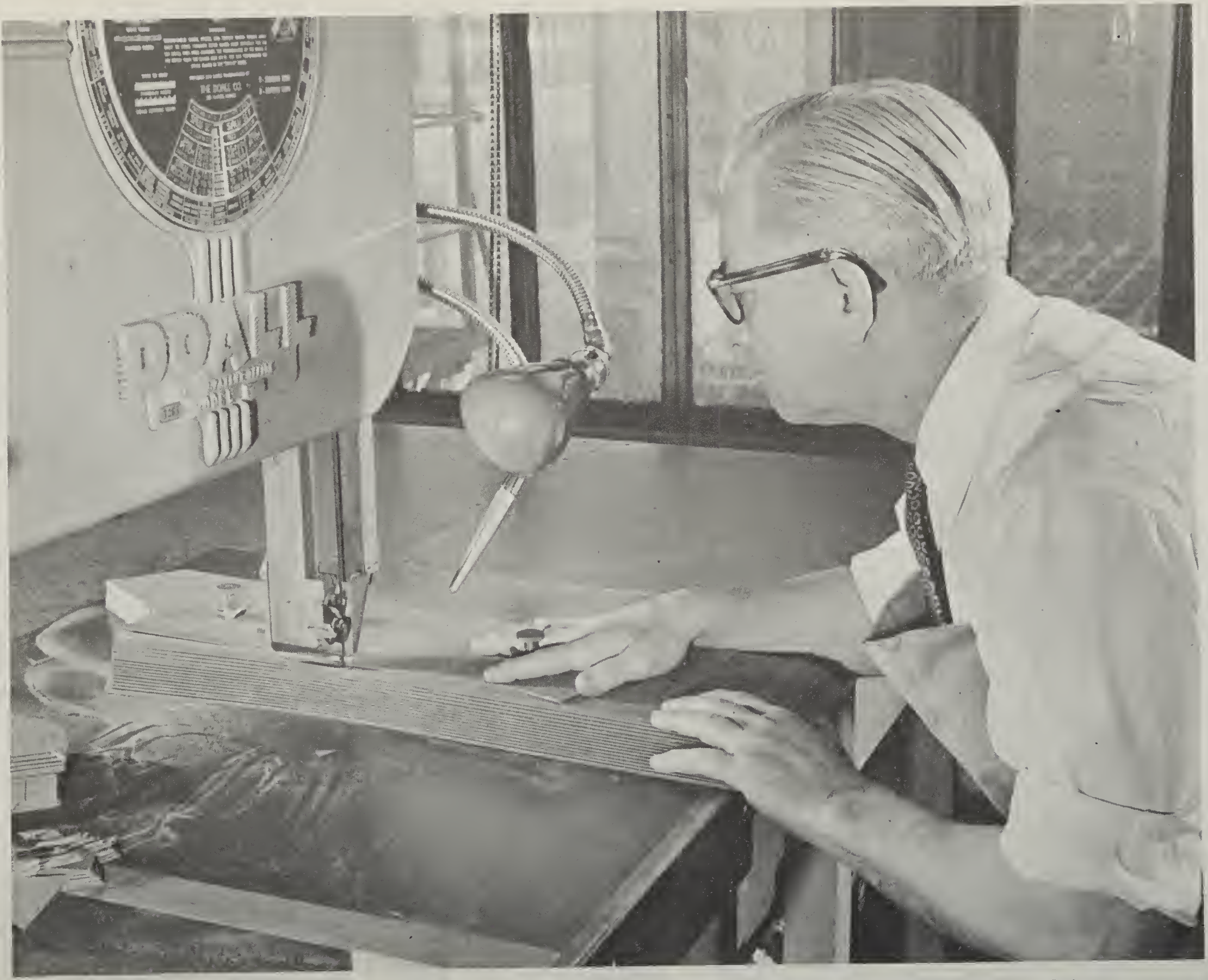


Fig. J Cutting duplicate patterns from pattern paper on a band saw. Note air nozzle below lamp to blow away dust.

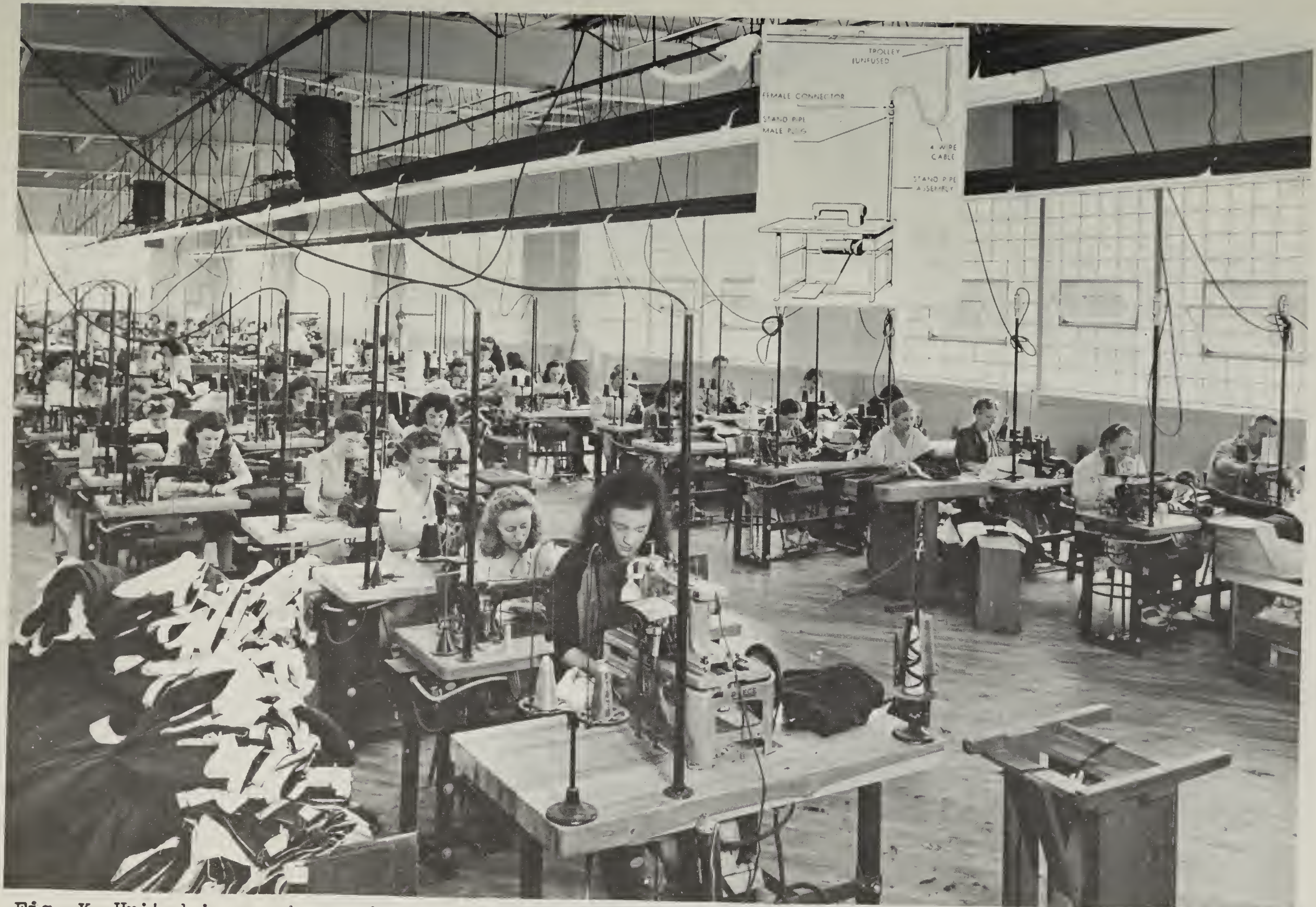
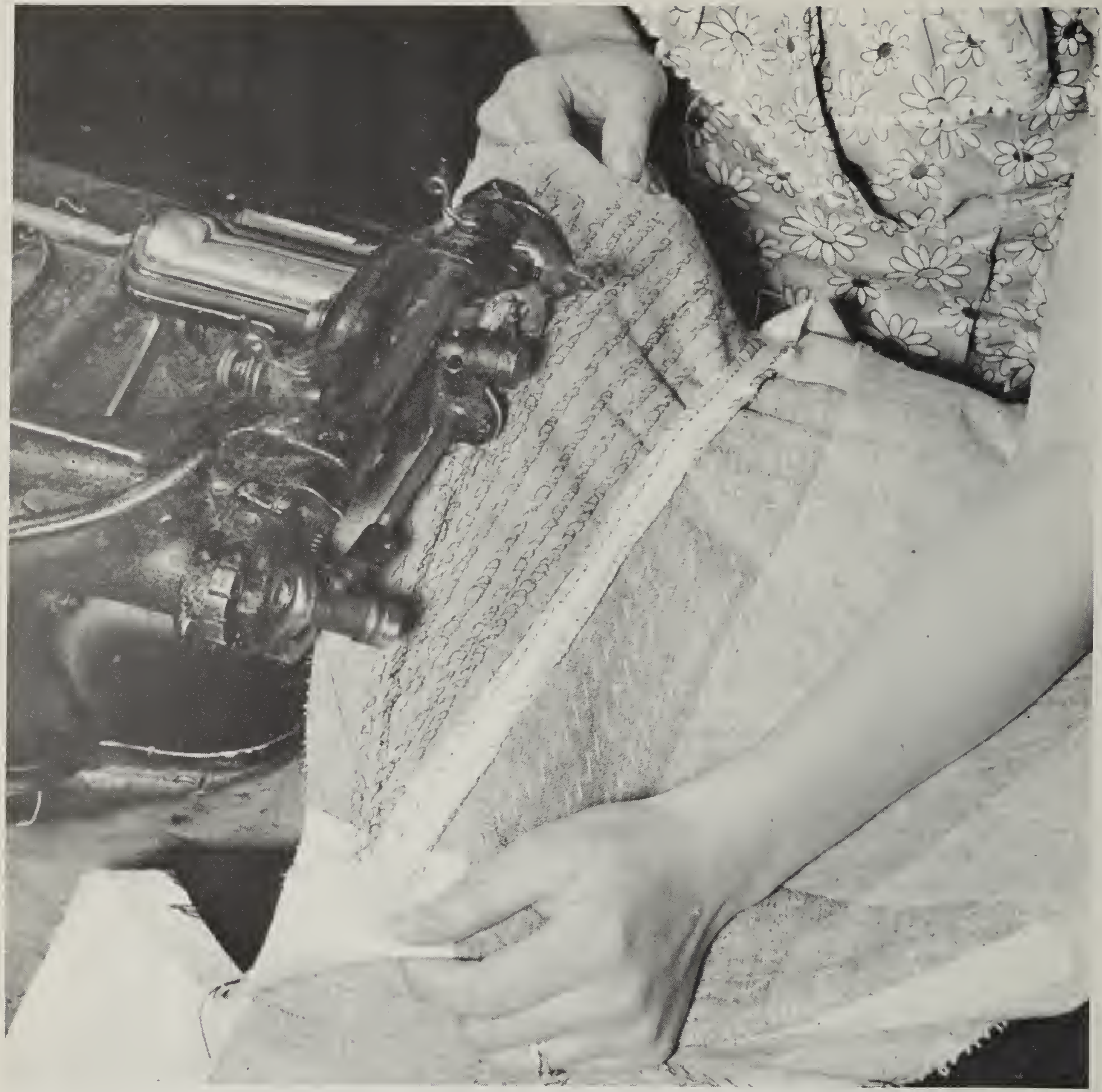


Fig. K Unit drive sewing machines in pants shop. Insert shows electrical connections. Girls in foreground are making buttonholes and sewing buttons.



Fig, L Basting the padding of the lapel and bridle of a low or medium quality sack coat.

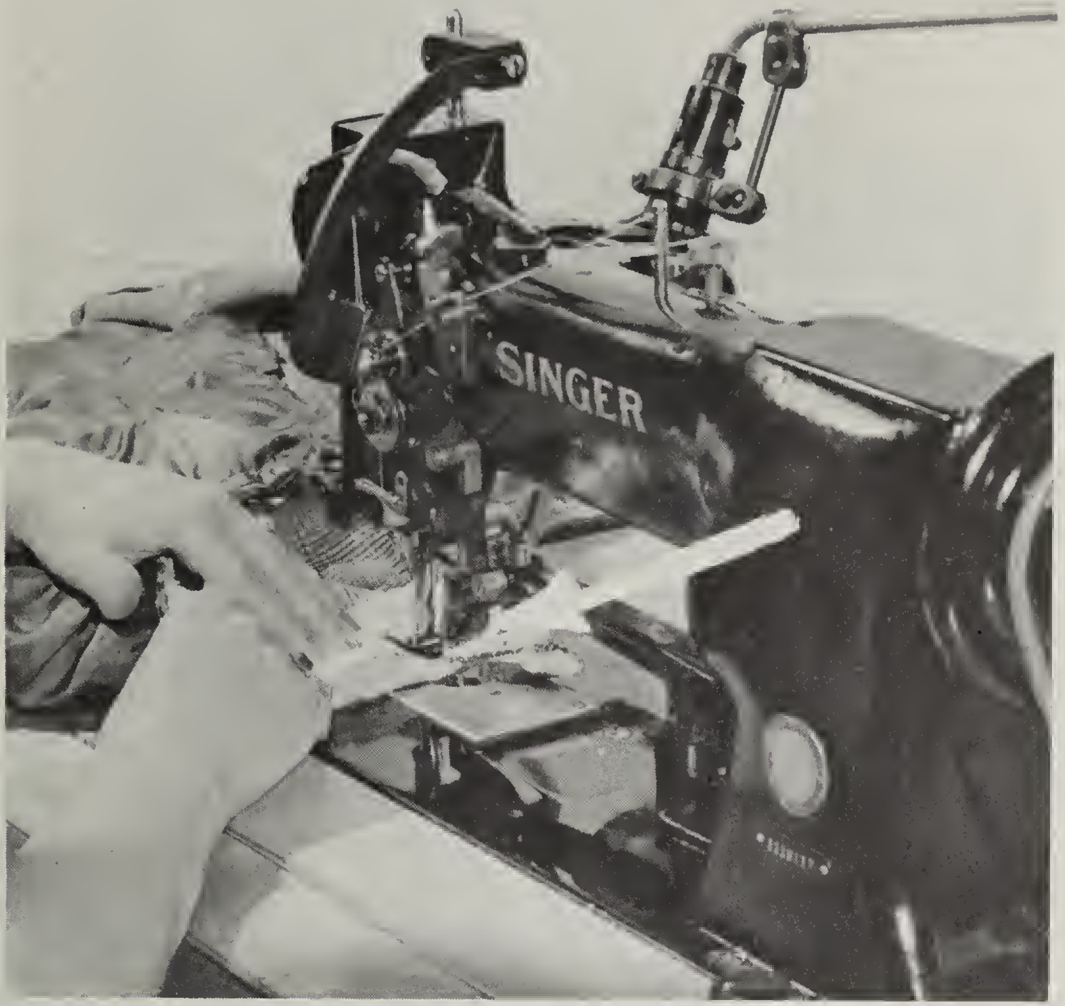


Fig. M Arrow points to attachment that trims shoulder pads as they are sewed into coat armholes.

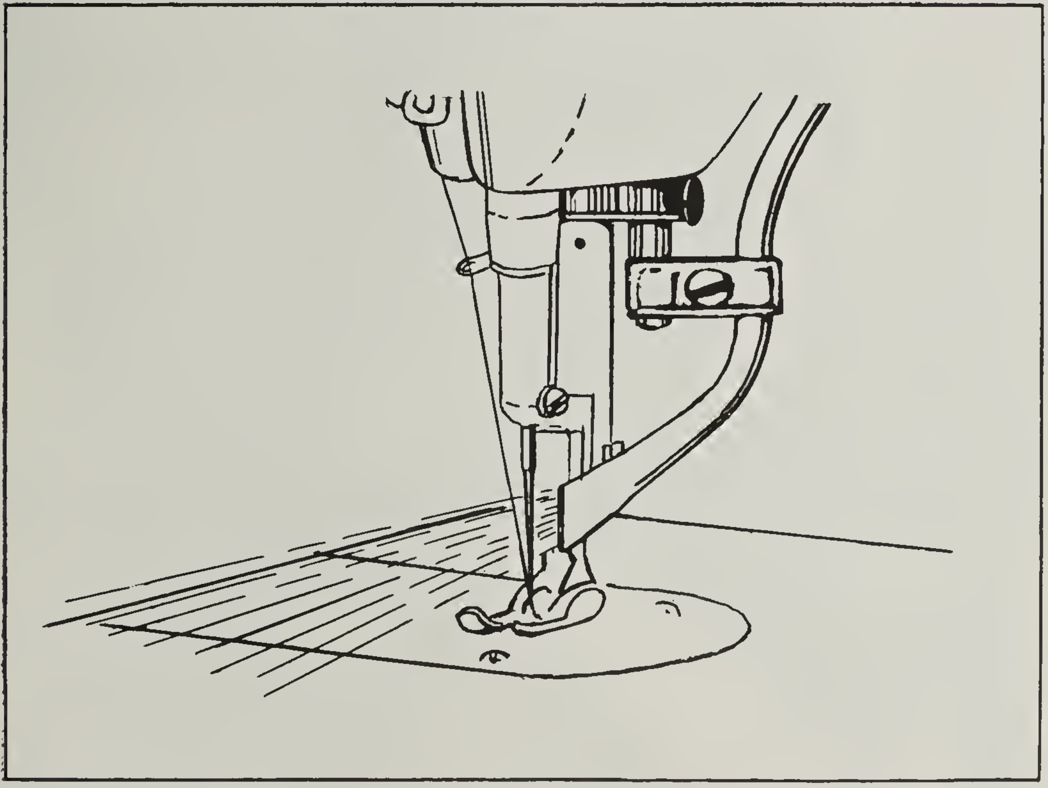


Fig. N Needle cooling device prolongs life of needle, reduces spoilage and thread from breaking overheated needles.

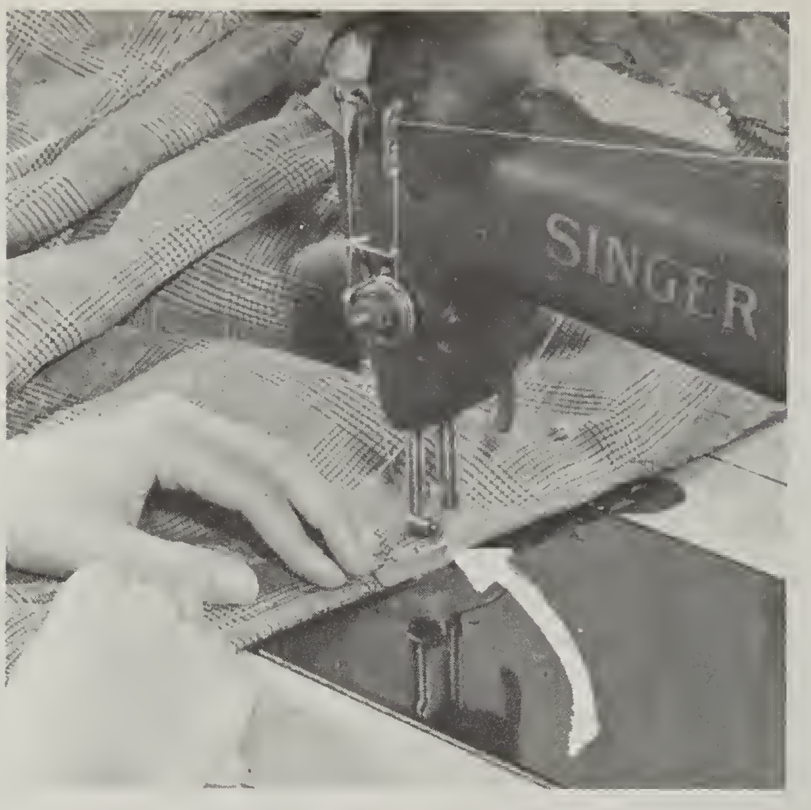


Fig. O Arrow points to guide attachment that keeps stitches an equal distance from edge of coat.

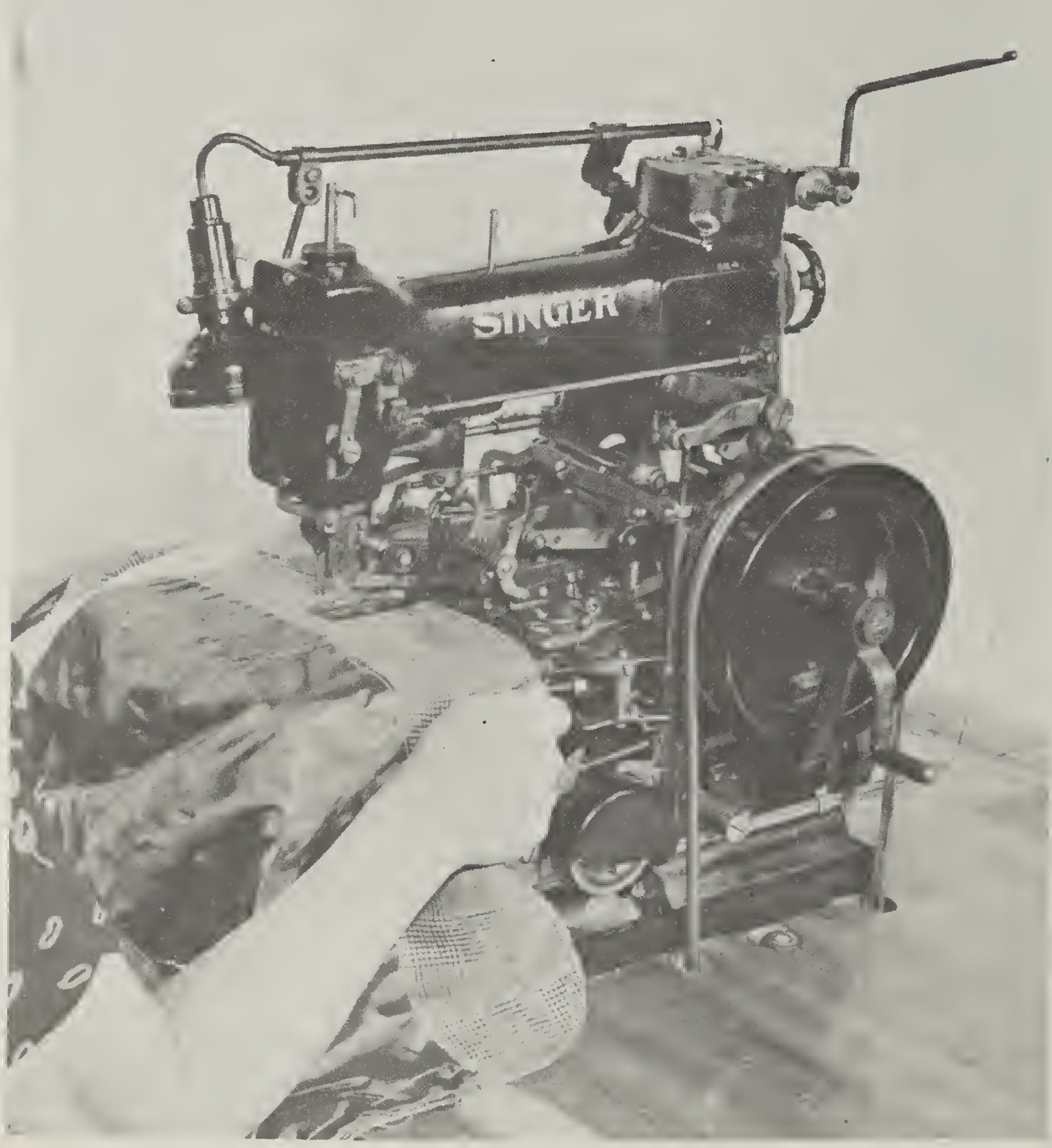


Fig. P Making buttonholes.

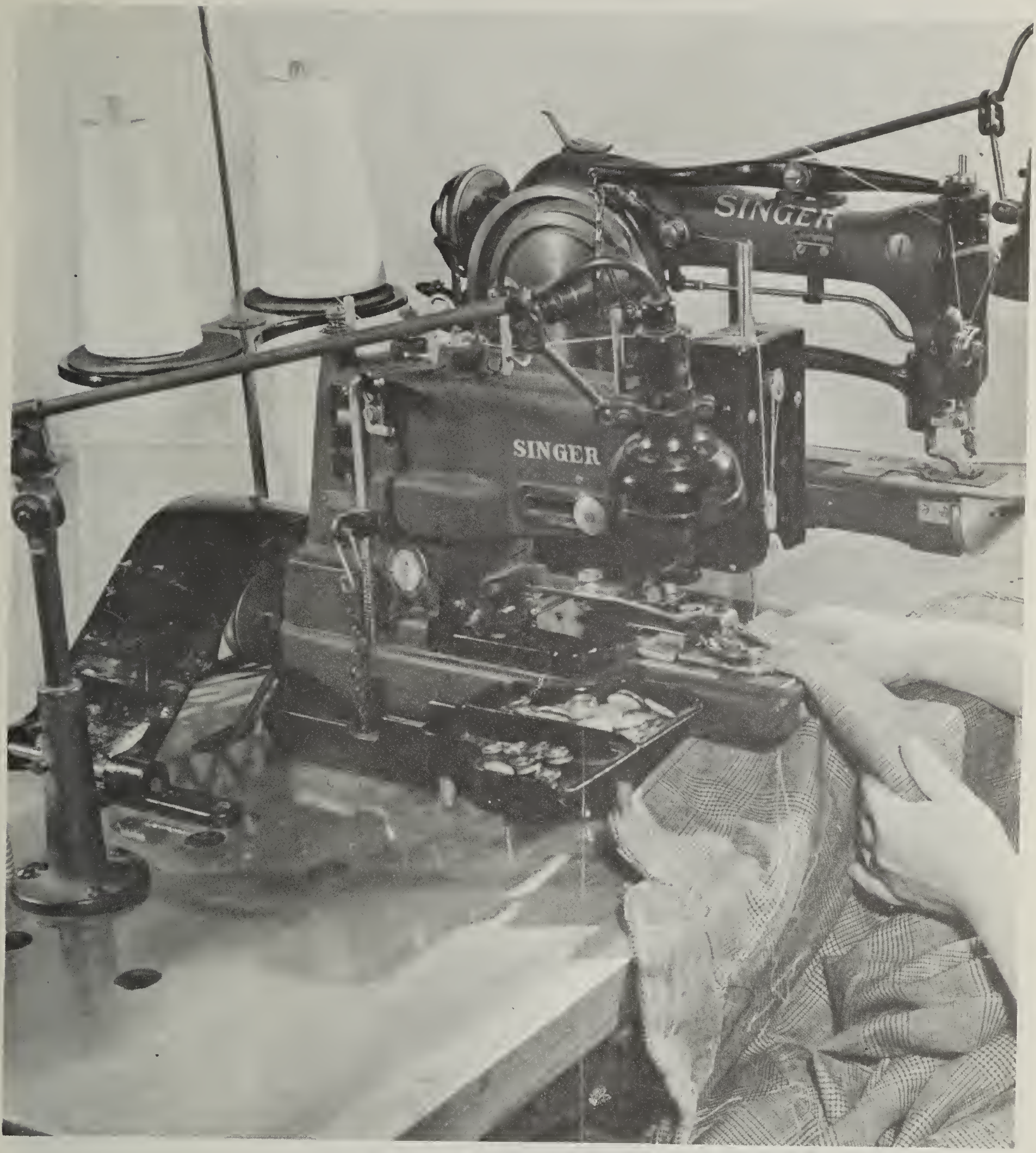


Fig. Q Button sewing.

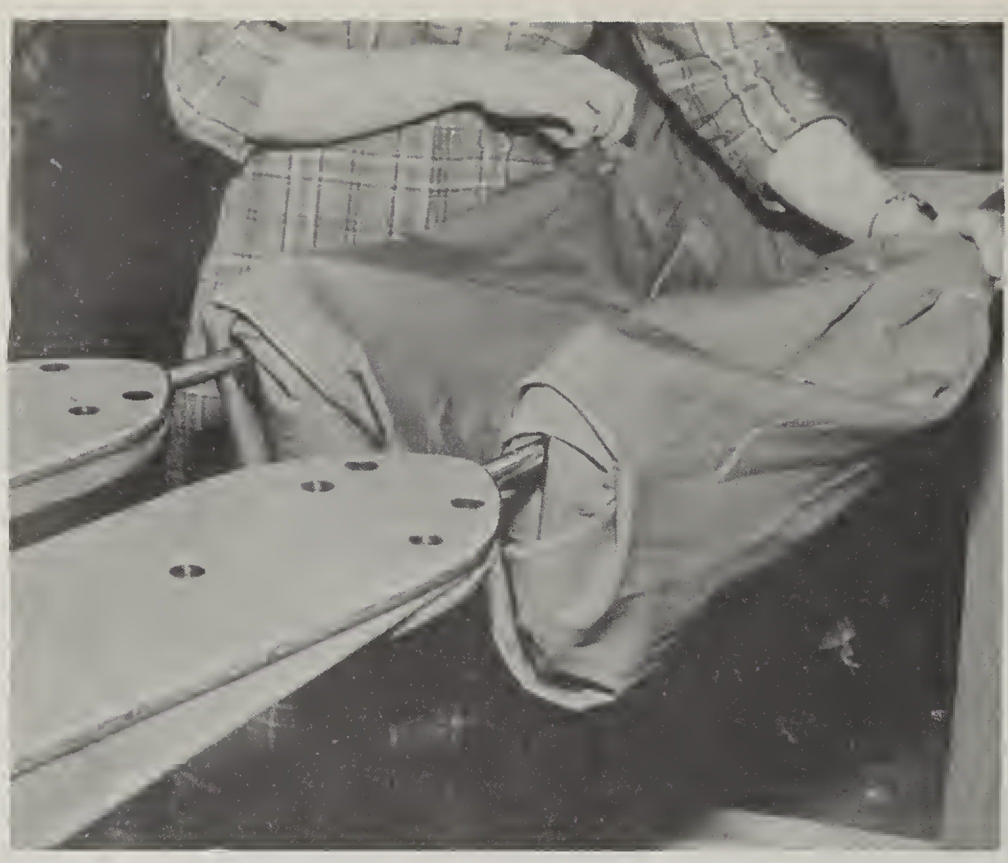


Fig. S Expanding pants form used with thread trimmer.

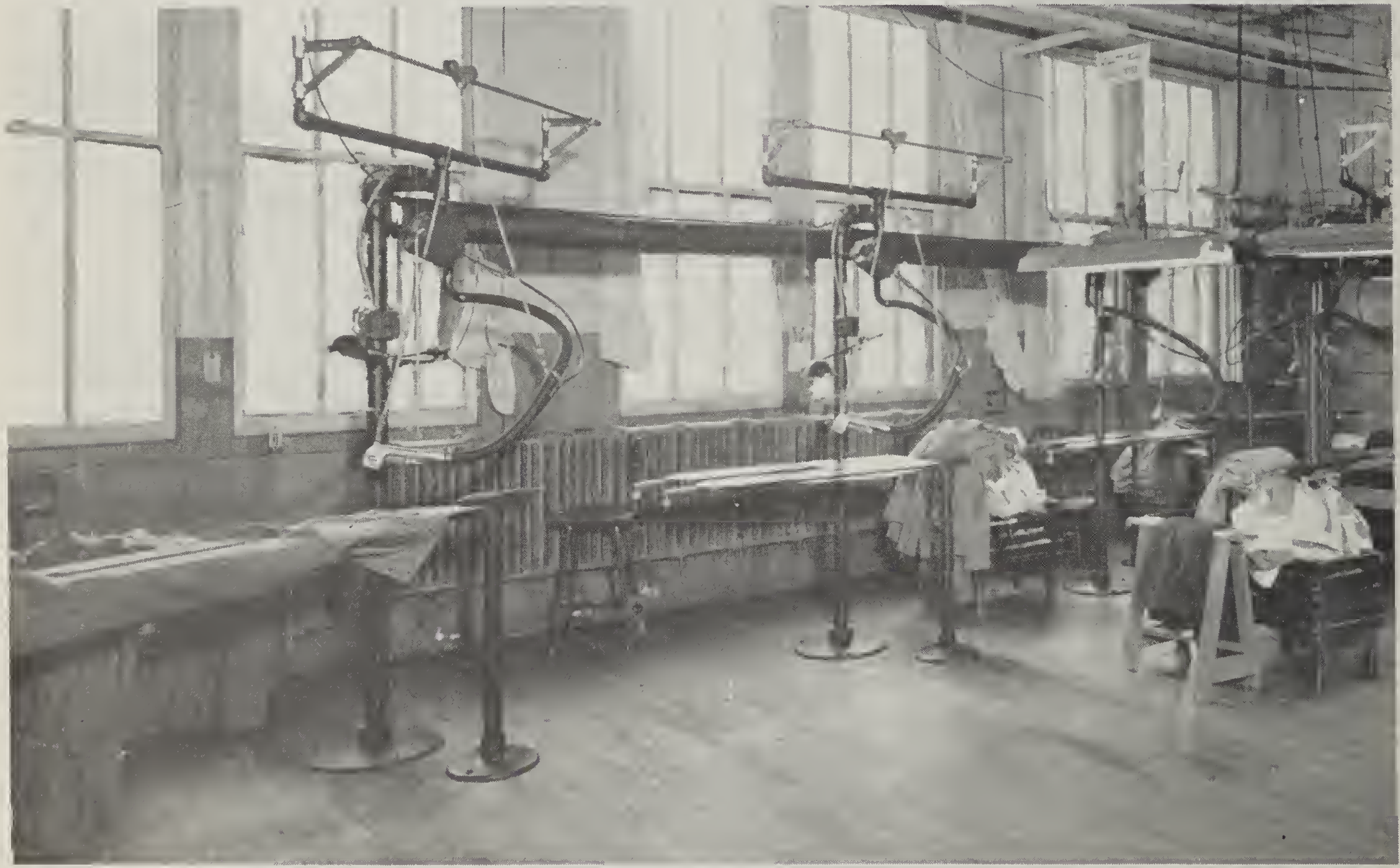


Fig. R Thread trimming machine for pants. Pants are spread on form, suction pulls threads into tube where electrically operated blades concealed in mouth cut them.

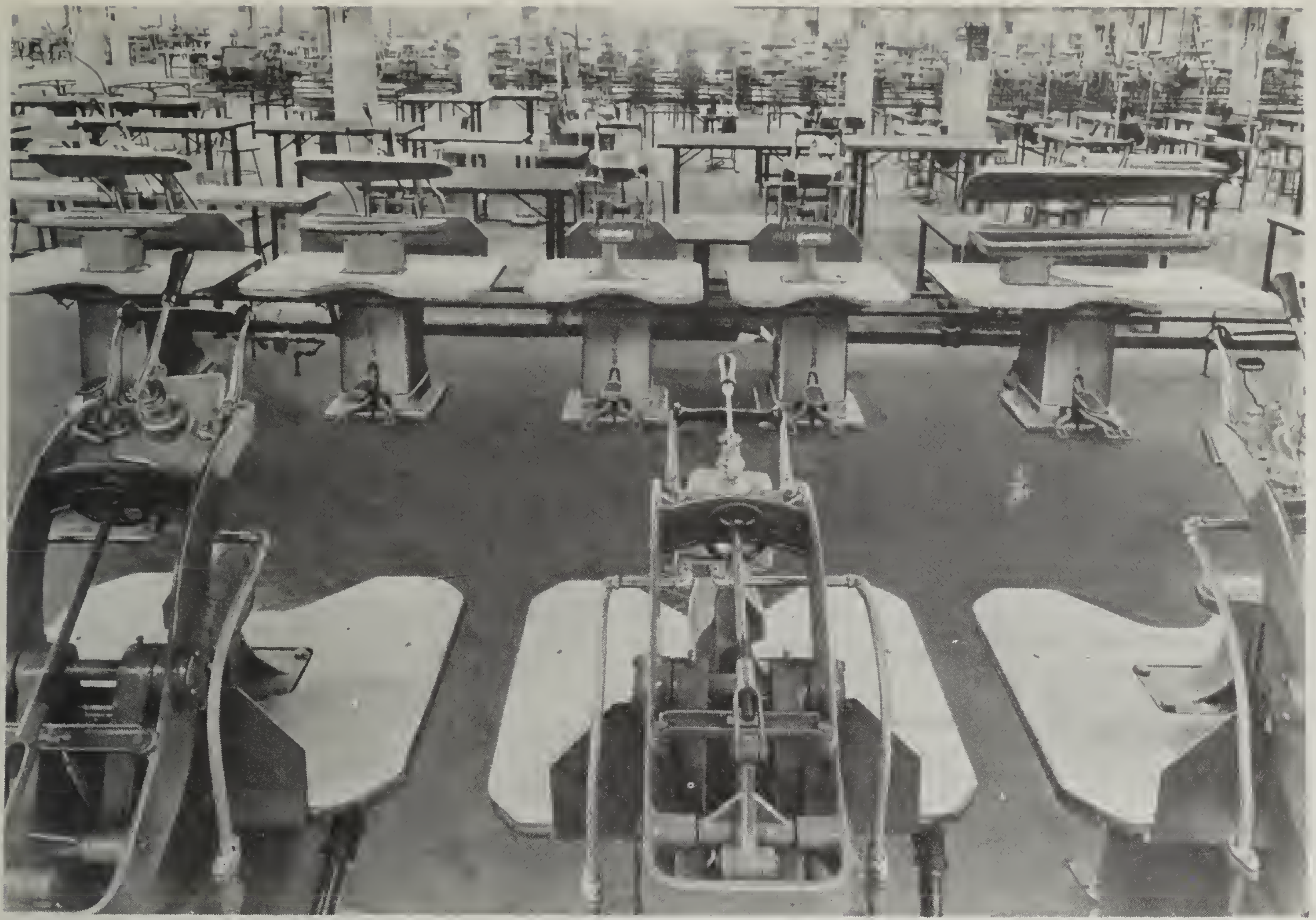


Fig. T A view of some of the presses used in the manufacture of men's topcoats.

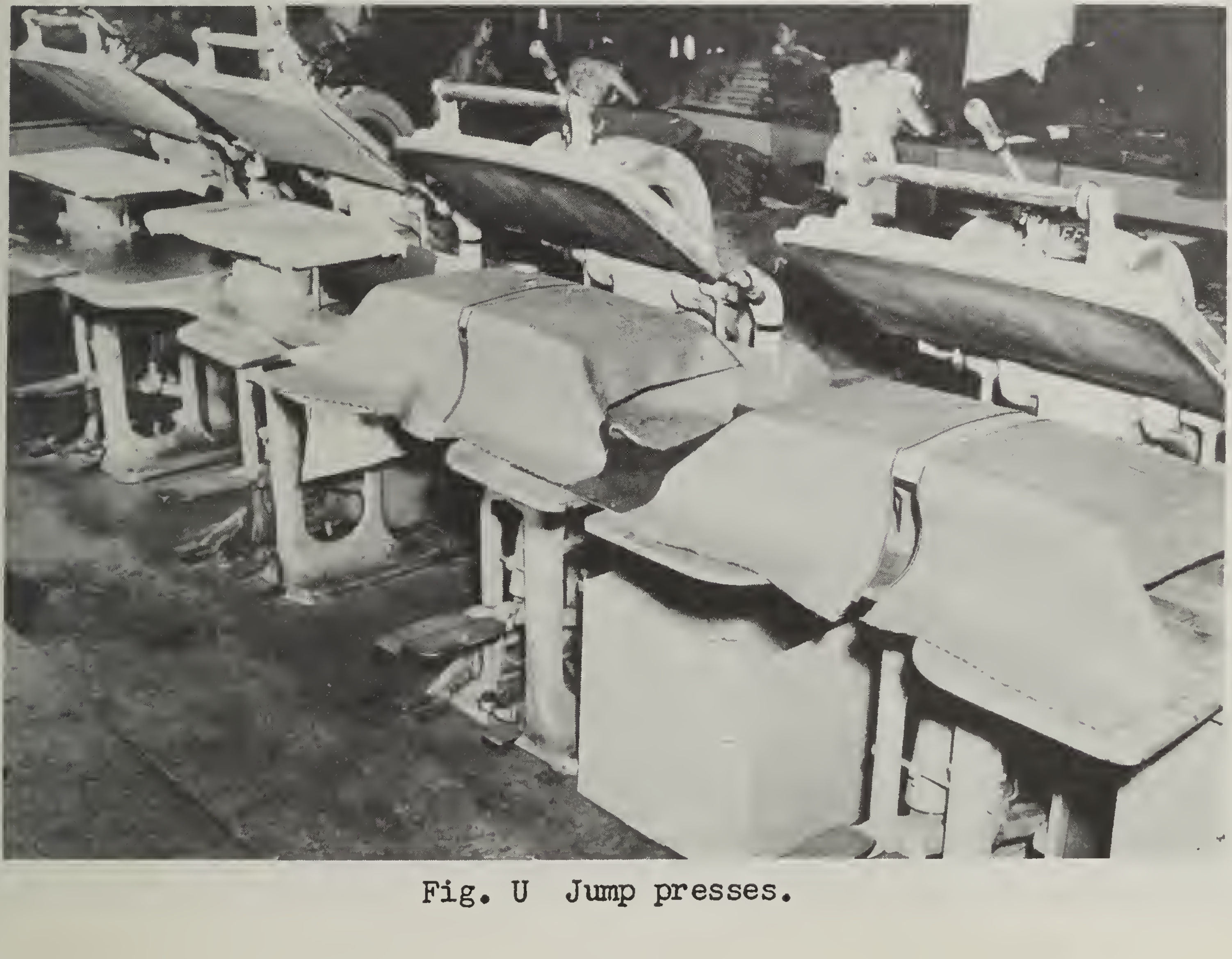


Fig. U Jump presses.

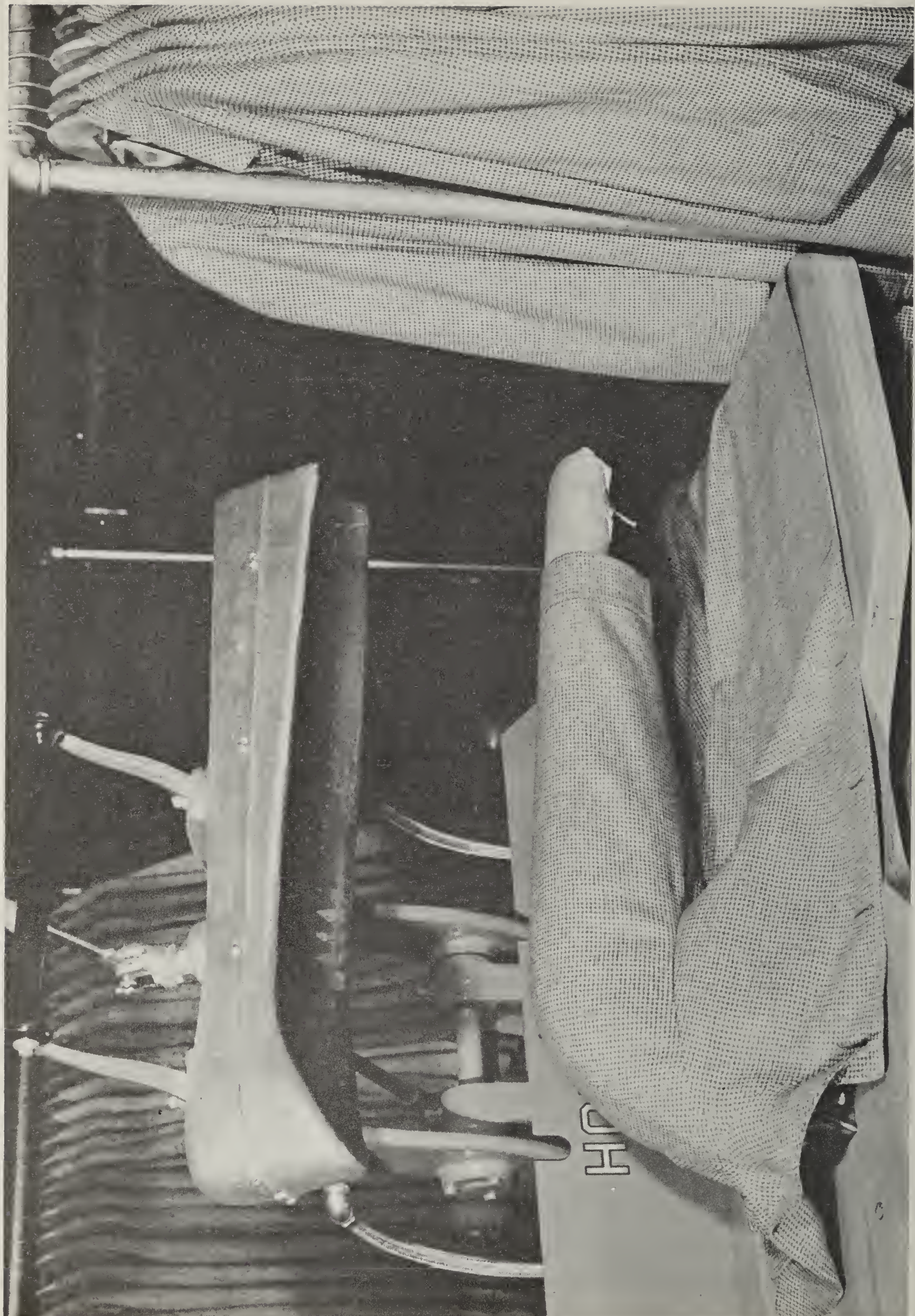


Fig. V Men's topcoat sleeve and shoulder press.

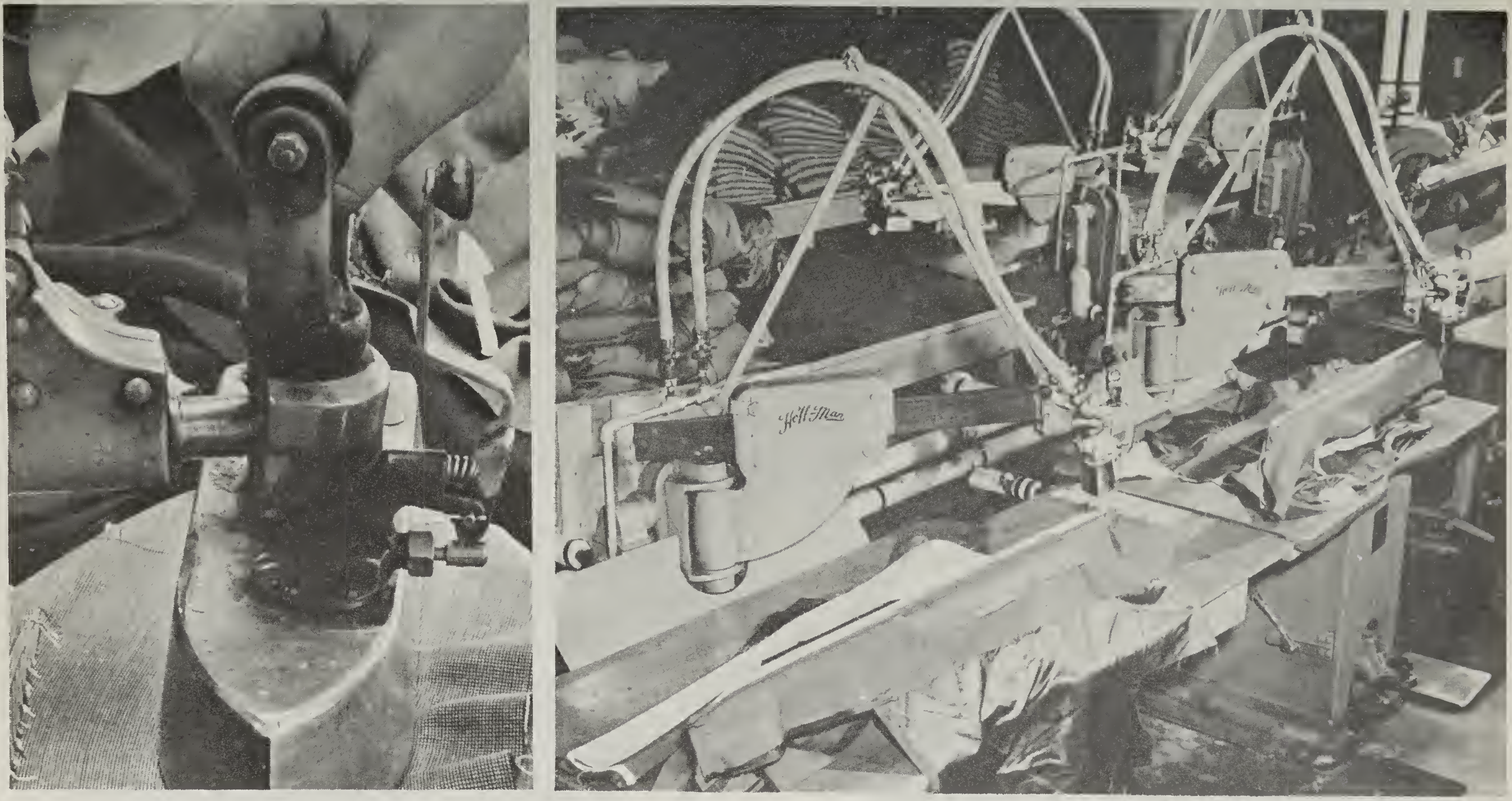


Fig. W Underpressing operations. Seams are pressed open by a jumper press. Operator puts iron in place, jumps on a treadle to press the iron firmly on the seam, and releases steam by the lever at the right of his thumb. (See arrow in left-hand picture.)

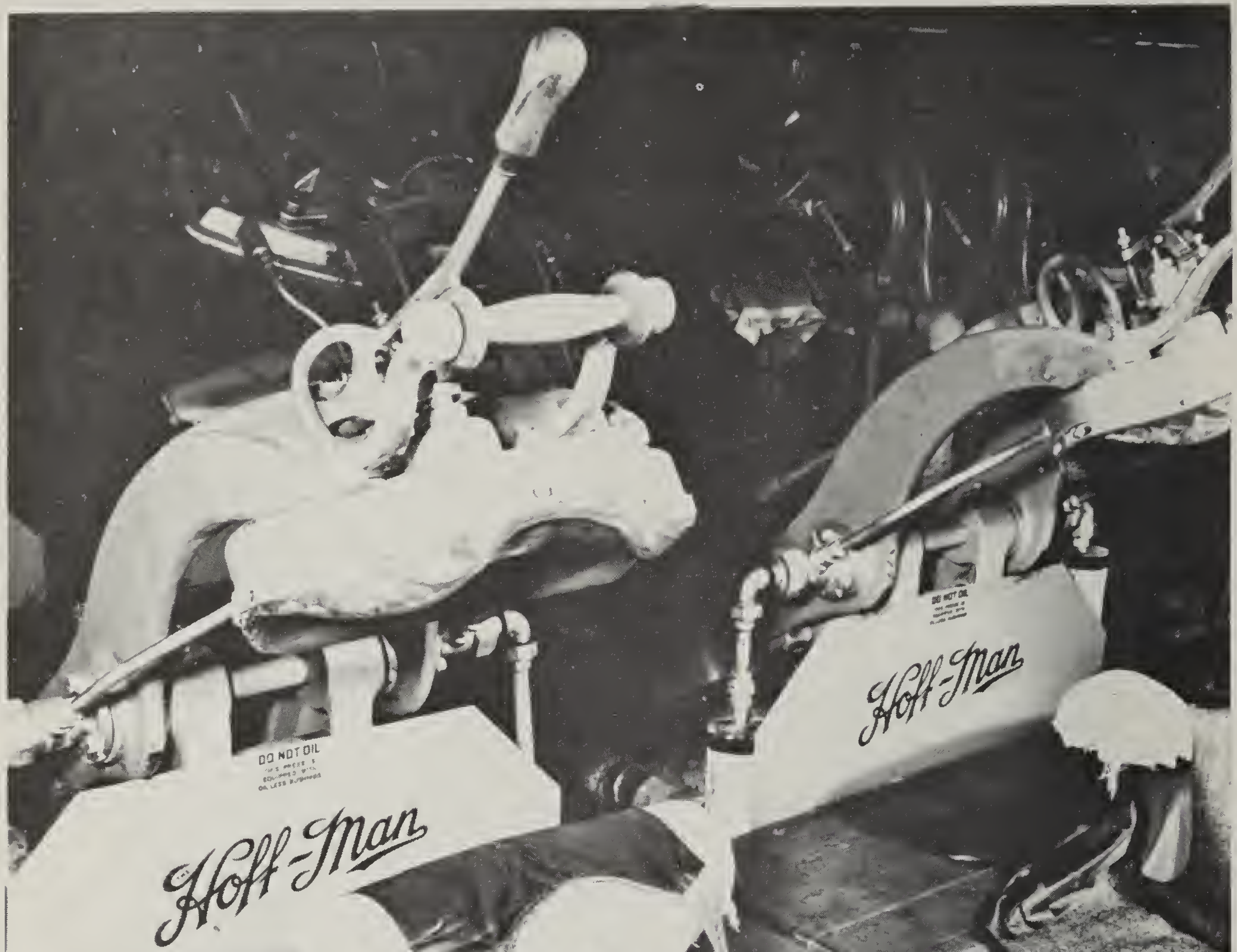


Fig. X Pressing machine that presses and shapes neck of vests in one operation.

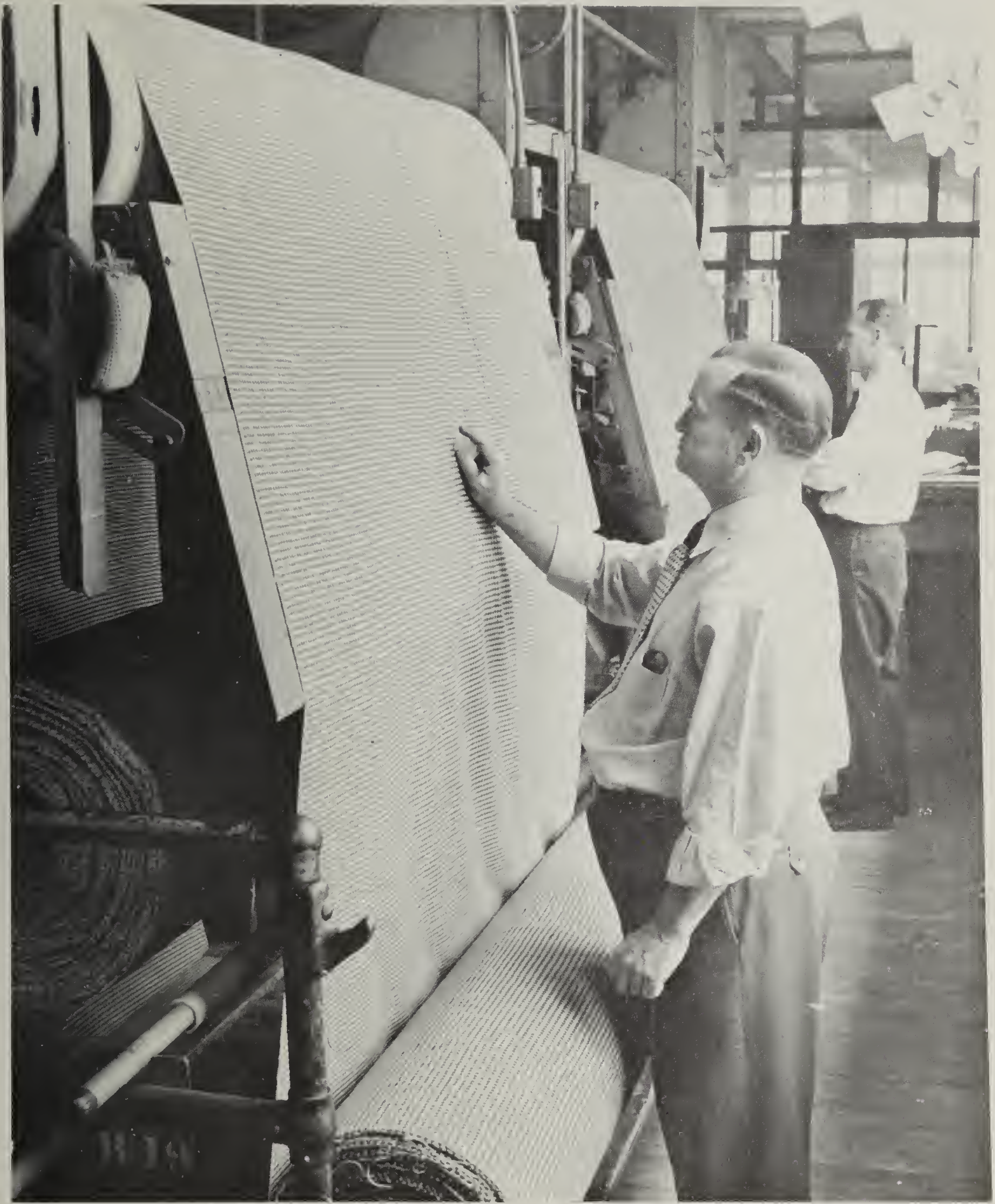


Fig. Y Fabric defects and deviations from specified widths are marked by examiners.

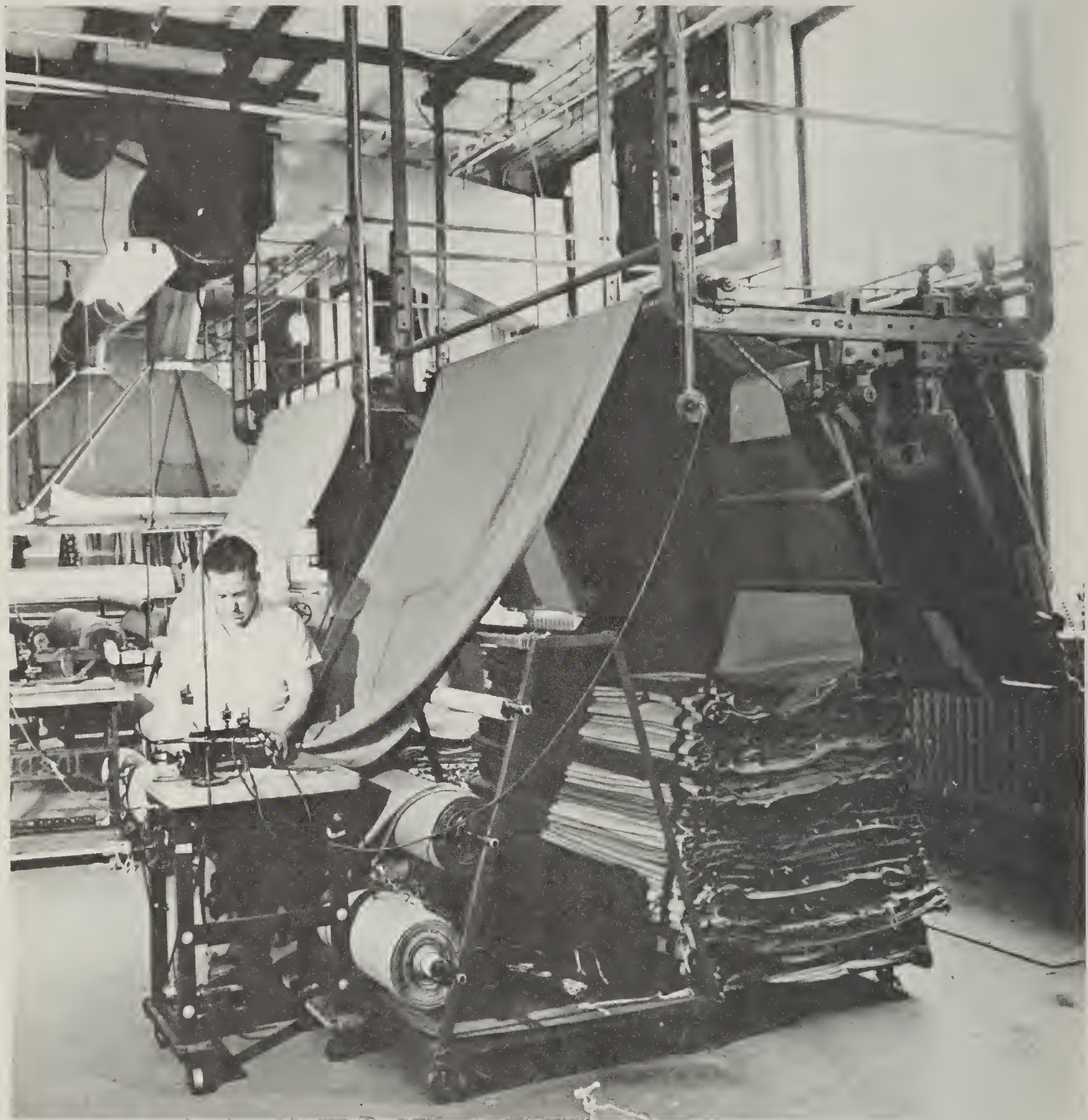


Fig. Z Continuous inspection of cloth is insured by sewing bolt ends of cloths together.

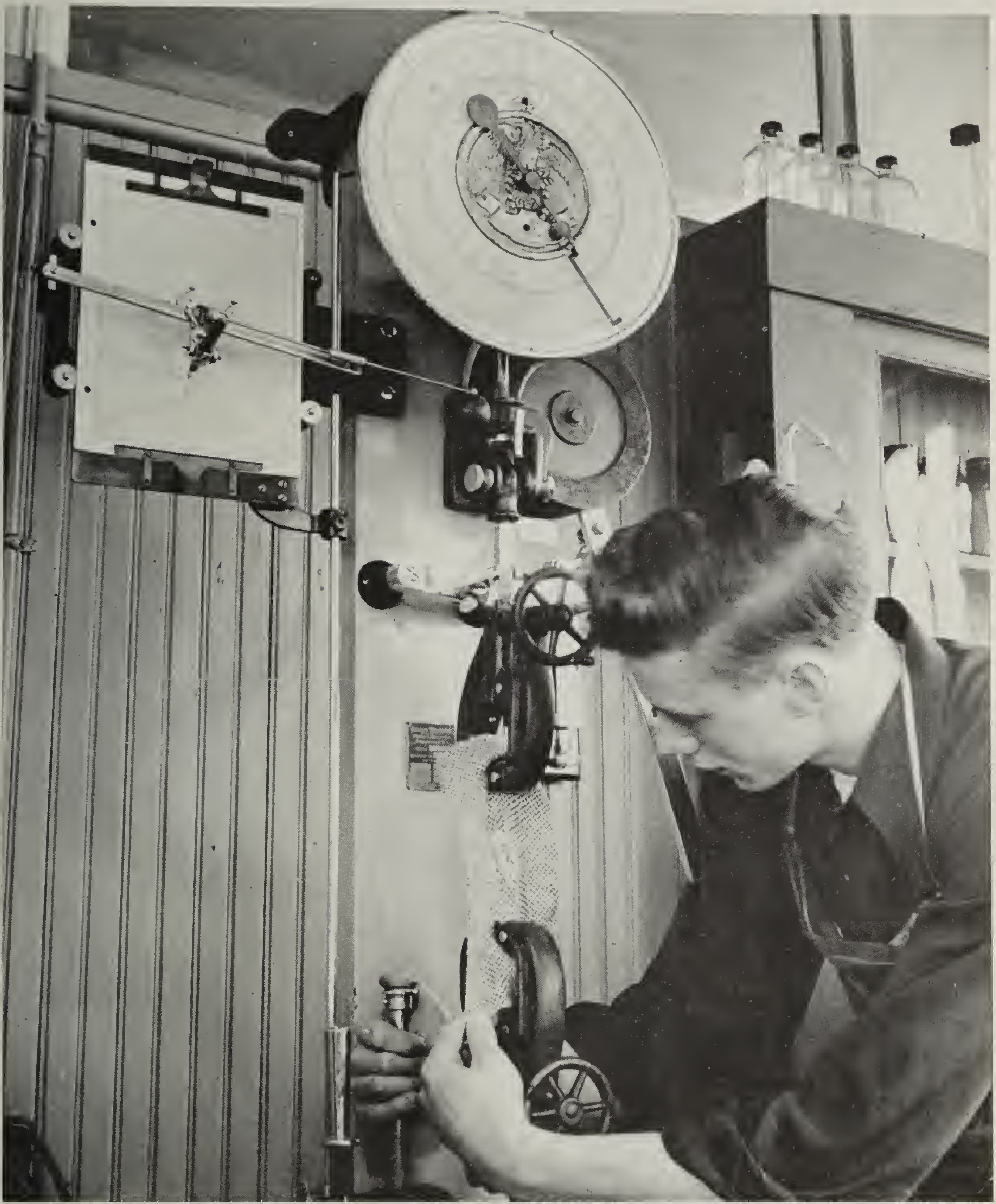


Fig. AA Testing the tensile strength of a sample swatch of fabric. Breaking point is shown on chart.

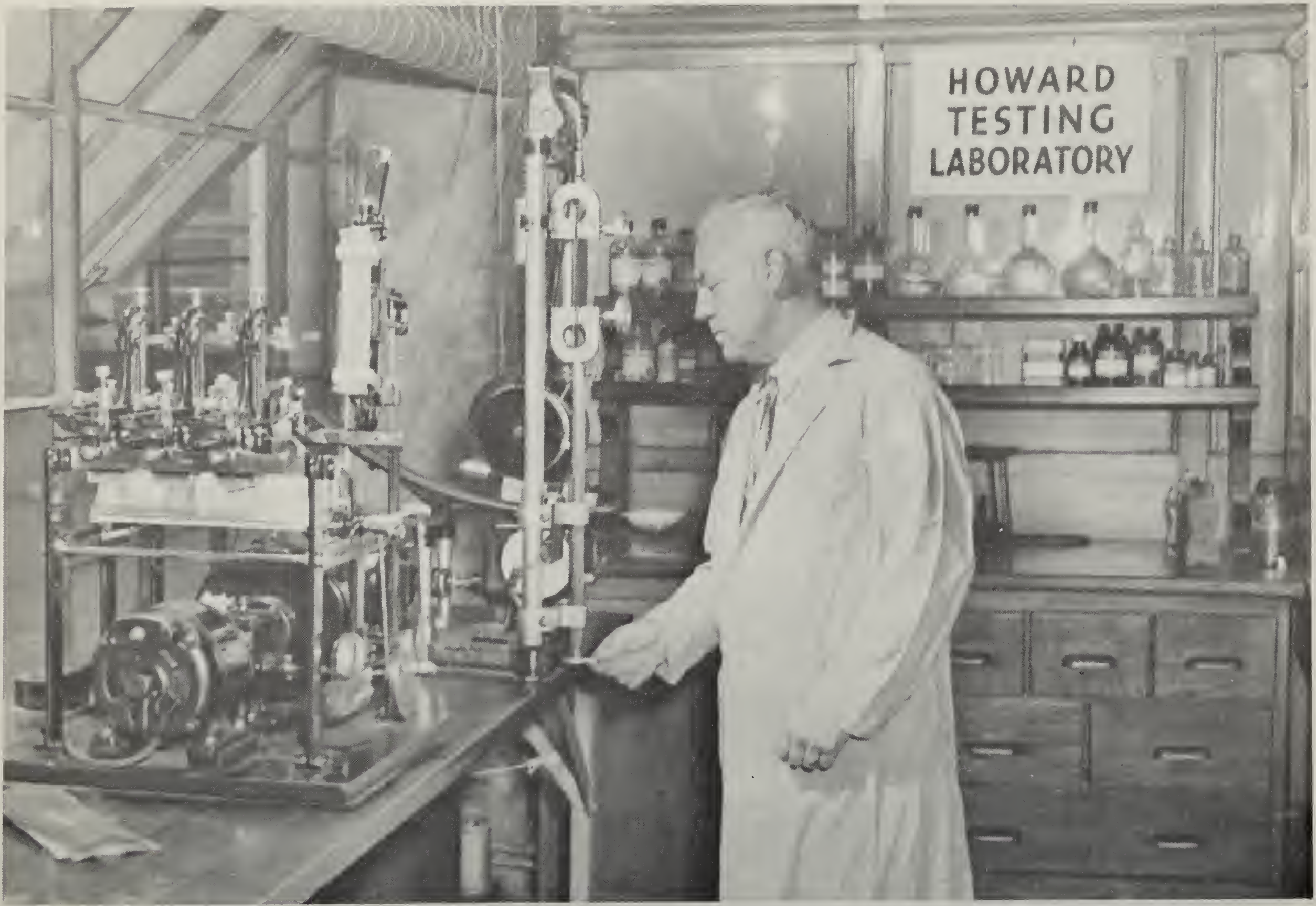


Fig. BB Piece goods inspection and testing for defects.

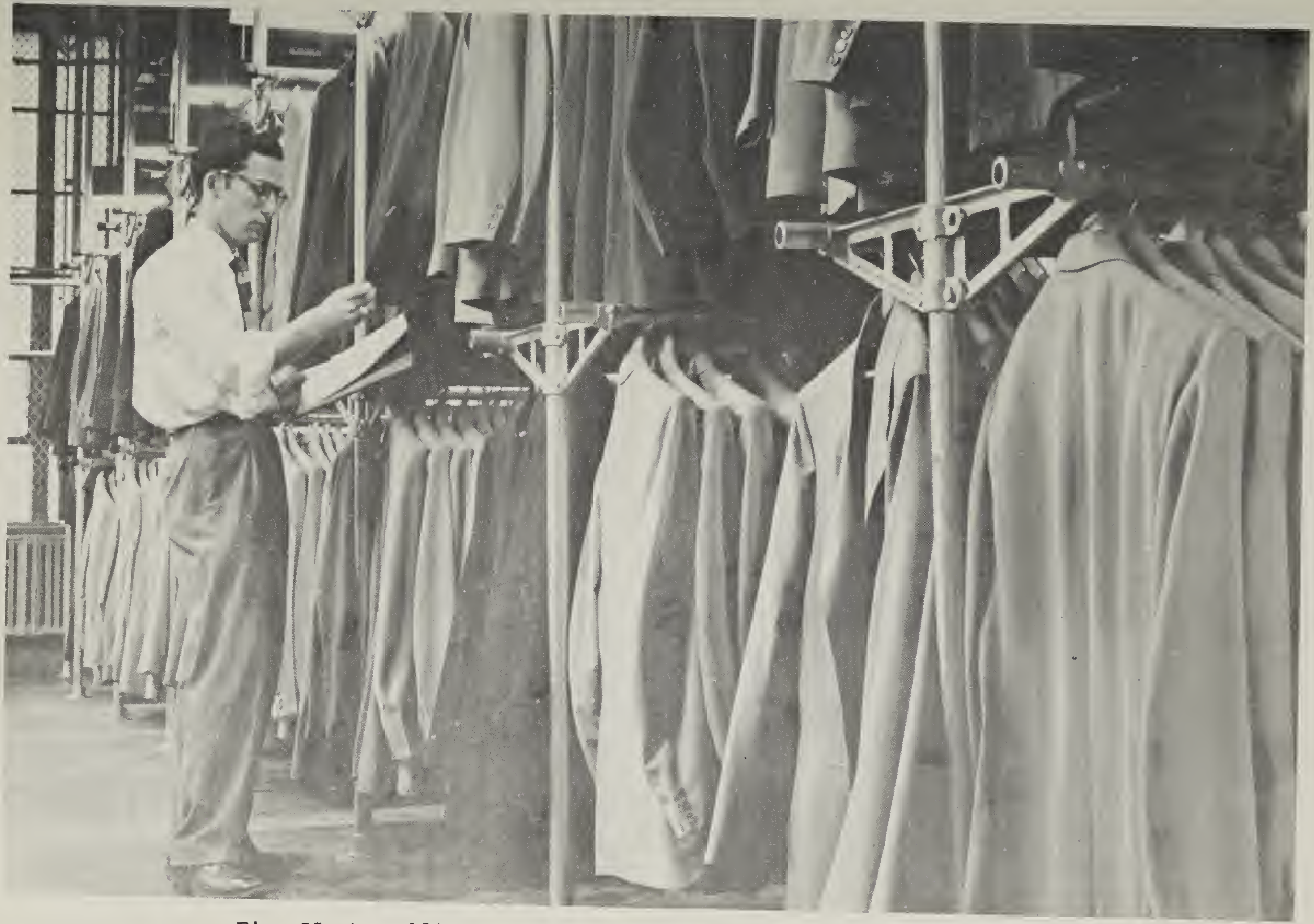


Fig. CC Assembling coats and pants by aid of identification tags.

Case Study Data on
Productivity and Factory Performance

MEN'S WINTER SUITS AND TOPCOATS

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Chapter II. DETAILED REPORT

Collection and Presentation of Data

The detailed data presented in Part II are intended for technical readers who may wish to compare a certain plant with the experience of plants in the United States. The tables present five major groups of information accompanied by a brief explanation of the data.

The preparation of these survey data involved three major steps: (1) A schedule was prepared with the advise and counsel of recognized authorities in management, labor, and trade associations; (2) the schedules were taken to the cooperating companies where the essential data were gathered by personal conferences with officials and from the companies' records; (3) the data obtained were evaluated, selected, and arranged into case method studies or statistical composites.

The "case study" method of presentation has been used in this report wherever possible. Unless otherwise noted, figures refer to actual plants, departments, and operations. Averages which may be computed from the data should be handled with caution. Small differences between the man-hour requirements of two plants may be attributed to the inclusion in one plant of some minor operation which was omitted in the other. Finally, similar operations may be performed differently in different plants. Such differences are cited in appropriate footnotes.

Specifications of Suits and Fabrics and Source of Trimmings

Table 1 shows factory price and characteristics of the suits for which operating times were reported by the plants studied. These operating times are shown in tables 9 through 13. All factors listed under characteristics, other than size, influence operating time. All plants reported on pants with zipper fly except plant E. Plants G, I, and J reported on pants with no pleats, and all plants except F reported on pants with a regular waistband. Plant F manufactures pants with a Hollywood waist. This type of waist is usually found on sport slacks. Other factors which may influence operating times are shown in tables 2 and 3.

Factory Man-Hour Requirements

Man-hour computations for this study are based on over-all plant production for an 8-week period between July and November of 1950, except for one plant which reported during the first quarter of 1950. The fall season was used in order to obtain data based on a steady level of production of men's winter suits. Production and hours can be determined accurately for the sack coat, pants, and vest making departments because each garment is made in separate shops in the making department.

The cutting man-hour experience

Table 1. Specifications for men's winter suits manufactured in 10 selected plants, U.S.A., 1950

Plant	Grade	Factory price	Number of pieces	Range of sizes	Characteristics of sack coat				
					Type 1/		Number of buttons	Pocket flaps	Number of inside pockets
					SB	DB			
A	4	$36.00	3	35-46	X		3	No	1
B	4	38.50	2	35-46	X		2	No	2
C	4	33.50-36.50	2	35-46	X		2	No	2
D	3	32.50	3	32-56		X	2	No	1
E	4	39.00	2	36-50		X	2	No	3
F 2/. . .	2+	33.50	2	34-44	X		3	Yes	3
G	4+	3/ 53.00	3	34-46	X		2	Yes	1
H	5	45.00-70.00	3	34-56	X		3	Yes	1
I	4	42.50	3	34-46	X		3	Yes	1
J	3+	3/ 35.00-45.00	3	34-48	X		2	Yes	1

1/ SB - Single breasted. DB - Double breasted.
2/ Sack coat has center vent.
3/ Retail price in firm's own outlet.

of each plant was more difficult to obtain. All the products manufactured by one plant are usually cut in the same department. An exception to this procedure is the cutting of trimmings in a separate department; however, trimmings for all garments manufactured by the plant are cut in this department. The unit man-hours for the cutting department of the plants studied were determined by adjusting standards to the actual performance of the company in this department. Four plants reported standards for their cutting department; for the remaining plants, an average industry standard was used. The standards function as a ratio by which actual hours are prorated to each product cut (table 4).

Cutting man-hours are dependent on many variables, and comparisons from plant to plant should be made with caution. Those factors having the greatest influence on cutting time are number of ply, number of sizes, type of fabric, and pattern of fabric (table 5).

Generally, the grade of sack coat and the man-hours required to make it show a direct relationship. (see table 6.) However, plant F producing a grade 2+ sack coat had higher man-hours than some grade 4 producers. Plant E and I had higher man-hours in the making department than plant H, the only grade 5 manufacturer. Plant J had the lowest man-hour requirements of all plants studied. This plant produces a grade 3+ sack coat by the combination method (see chapter III for description of production methods). Other features of plant J which are conducive to high productivity are generous working space per employee, improved plant layout, the limited number of models produced, unit drive machines, production for stock, and company-owned retail outlets.

Plant J also has the lowest man-hour requirements for pants (see (table 7.) Most plants in this survey required about one direct man-hour per pair of pants in the making department. Plant H, the grade 5 man-

Table 2. Specifications of fabric used in men's winter suits in 10 selected plants, U.S.A., 1950

Plant	Grade	Factory price of suit	Type of cloth	Pattern	Thread count
A . . .	4	$36.00	Worsted	Plain	na
B . . .	4	38.50	Worsted	Striped	na
C . . .	4	33.50 36.50	Worsted	60% Plain 25% Striped 15% Plaid	Varies
D . . .	3	32.50	Worsted	Plain & Striped	66x61
E . . .	4	39.00	Worsted	Plain	na
F . . .	2+	33.50	Worsted	Plain	64x60
G . . .	4+	2/ 53.00	Worsted	25% Plain 65% Striped 10% Plaid	62x60
H . . .	5	45.00-70.00	Wool	Striped	na
I . . .	4	42.50	na	Plain	na
J . . .	3+	35.00-45.00	Worsted	Plain, striped, & plaid	Varies

		Weight (ounces per running yard)	Ply	Width (inches)	Quality of rayon lining	Average yardage per suit		
						Cloth	Lining	Canvas
A . . .	4	13.50-14.03	2	57	Medium	3-1/2	1-1/2	(1/)
B . . .	4	13.50	2	na	High	3	2-7/8	16/36
C . . .	4	12.00	2	56	Medium	3-1/3	2-1/4	3/4
D . . .	3	na	2	na	Medium	na	na	na
E . . .	4	13.50	2	58	Medium	3-1/2	2	1/2
F . . .	2+	12.50-13.50	1&2	55-60	Medium	3-1/4	1-1/3	1/4
G . . .	4+	14.50	2	60	High	3-1/2	1	27/36
H . . .	5	13.00	2	56	High	3-22/36	2-1/4	1/2
I . . .	4	14.00-14.50	2	56-57	Medium	3-1/8	1-1/4	na
J . . .	3+	12.00-13.00	2	58	Medium	3-1/4	1-1/2	1

na Not available.
1/ Bought cut.
2/ Retail price.

Table 3. Source of trimmings used in the manufacture of men's winter suits in 10 selected plants, U.S.A., 1950

Plant	Grade	Parts							
		Coat fronts		Trouser waist band		Shoulder pads		Buttonhole making	
		Make	Buy	Make	Buy	Make	Buy	Make	Buy
A	4		X	50%	50%		X	X	
B	4		X	X			X	X	
C	4	X			X		X	X	
D	3		X		X		X	X	
E	4		X		X		X	X	
F	2+	33%	67%		X 1/		X	X	
G	4+	X		X		X		X	
H	5		X	na			X	X	
I	4	X			X		X	X	
J	3+	X		X			X	X	

		Parts - continued					
		Bridle stays		Tapes		Piping	
		Make	Buy	Make	Buy	Make	Buy
A	4	X			X		X
B	4	X		75%	25%	X	
C	4	X		X			X
D	3	80%	20%		X		X
E	4		X		X		X
F	2+		X		X		X
G	4+	X			X	X	
H	5		X		X	(2)/	
I	4	X			X		X
J	3+	X			X	X	

na Not available.
1/ Purchase waistband lining.
2/ Not used.

Table 4. Standards used in prorating total cutting man-hours to each product in four selected men's winter suit plants, U.S.A., 1950

Product	Ratio of standard time to actual time in cutting department				Average industry standard
	Plant standard				
	C	D	H	I	
Sack coat	0.60	0.50	0.50	0.62	0.46
Pants	.30	.33	.33	.25	.31
Vest	.10	.17	.17	.13	.23
Suit	1.00	1.00	1.00	1.00	1.00

The following is an example of adjusting standards to actual performance:

Given a plant's production for each product, total direct man-hours, and average industry standards

Product	Production	Average industry standard
Sack coats	52150	.46
Pants	58460	.31
Vest	9940	.23

Total direct man-hours for cutting department 22810.

Then, multiply production of each garment by its standard and sum the result. This sum is total standard direct man-hours.

$$\begin{array}{r} 52150 \times .46 = 23989 \\ 58460 \times .31 = 18123 \\ 9940 \times .23 = \underline{\ \ 2286} \\ 44398 \end{array}$$

Then, divide this sum into total actual direct man-hours, i.e. standard into actual man-hours.

$$\begin{array}{r} .5138 \\ 44398\overline{)22810} \end{array}$$

Then, multiply this quotient by the individual product standard. The result is cutting man-hours per unit.

Sack coat .5138 x .46 = .236 unit man-hours
Pants .5138 x .31 = .159 " " "
Vest .5138 x .23 = .118 " " "

ufacturer, has the highest direct man-hour requirements.

Vest production is being discontinued or subcontracted by many plants in the United States. Table 8 gives man-hour data from those plants who reported on their production of vests. Plants C and G could not report man-hours on vests because they were manufactured in conjunction with another product. The great decrease in production of vests in the past 5 years has been accompanied by an increase in man-hour requirements.

Cutting Department: Characteristics and Operations

Cutting time in tables 9 and 10 is based on two-piece suits for plants B, C, F, and G. These tables show the plant characteristics which directly influence cutting operations. Plants C and G furnished data on workers' output per eight-hour day. Planned daily production of the other plants is provided in the footnotes of table 11. This may be used as a comparison of over-all performance, since production in the cutting and making departments must be the same over a period of time.

Cutting and ticketing machines are all unit driven in the plants studied. Electric power is supplied to cutting machines by a rail above and parallel to the cutting table. This feedrail provides greater mobility for the cutting machines.

Making Department: Characteristics and Operations

Tables 12 and 13 show operating times and major factors influencing man-hours in the making department. The tables on the following pages give 103 operations in the sack coat shop, 41 in the vest shop, and 54 in the pants shop. These operations are identified by number to facilitate inter-plant comparisons. Detailed operating data were not available for plant A. Plant H supplied data on vests and pants based on operations performed in their shops which differ from those per-

Table 5. Standard time allowance in minutes for cutting one-pants suits

Plys	Standard time in minutes 1/ and number of sizes in a lay							
	1	2	3	4	5	6	7	8
1	50	100	150	200	250	300	350	400
2	58	116	174	232	290	348	406	464
3	66	132	198	264	330	396	462	528
4	74	148	222	296	370	444	518	592
5	82	164	246	328	410	492	574	656
6	89	178	267	356	445	534	623	712
For each additional ply up to 45	add 5	add 10	add 15	add 20	add 25	add 30	add 35	add 40

1/ Time is based on cut complete: spread, mark, cut and fit, including boring holes in vests from one to three high, (excludes patches, flaps, welts and slashes in fitting). Cutter must assemble garments and fittings four-ply and up; boy will tie same.

Table 6. Factory man-hours required to make a sack coat in 10 selected men's winter suit plants, U.S.A., 1950

Plant	Grade	Total	Man-hours per sack coat					
			Cutting department			Making department		
			Total	Direct	Indirect	Total	Direct	Indirect 1/
A	4	4.392	0.300	0.211	0.089	4.092	3.723	0.369
B	4	4.579	.307	.251	.056	4.272	3.716	.556
C	4	5.284	.573	.332	2/ .241	4.711	4.406	2/ .305
D	3	3.428	.193	.169	.024	3.235	2.823	.412
E	4	6.452	.331	.214	.117	6.121	4.922	3/ 1.199
F	2+	4.568	.303	.216	.087	4.265	3.367	3/ .898
G	4+	na	na	na	na	5.192	4.590	.602
H	5	6.331	.873	.590	.283	5.458	4.570	.888
I	4	6.441	.392	.263	.129	6.049	5.640	.409
J	3+	3.401	.178	.146	.032	3.223	2.796	.427

na Not available.

1/ Includes non-departmental indirect.

2/ Non-departmental indirect included in cutting department indirect.

3/ Indirect labor also includes time spent in servicing other shops of the plant not covered by this survey. The hours for the shops reporting cannot be separated from the total indirect man-hours. Therefore, indirect unit man-hours are overstated.

Table 7. Factory man-hours required to make a pair of pants in 10 selected men's winter suit plants, U.S.A., 1950

Plant	Grade	Total	Man-hours per pair of pants					
			Cutting department			Making department		
			Total	Direct	Indirect	Total	Direct	Indirect 1/
A	4	1.189	0.198	0.139	0.059	0.991	0.920	0.071
B	4	1.342	.203	.166	.037	1.139	.991	.148
C	4	1.434	.287	.166	2/ .121	1.147	1.099	2/ .048
D	3	1.094	.129	.113	.016	.965	.842	.123
E	4	1.549	.218	.141	.077	1.331	1.070	3/ .261
F	2+	1.336	.199	.142	.057	1.137	.925	3/ .212
G	4+	na	na	na	na	.882	.855	.027
H	5	2.512	.583	.394	.189	1.929	1.606	.323
I	4	1.337	.157	.105	.052	1.180	1.101	.079
J	3+	.864	.117	.096	.021	.747	.679	.068

na Not available.

1/ Includes non-departmental indirect.

2/ Non-departmental indirect included in cutting department indirect.

3/ Indirect labor also includes time spent in servicing other shops of the plant not covered by this survey. The hours for the shops reporting cannot be separated from the total indirect man-hours. Therefore, indirect unit man-hours are overstated.

Table 8. Factory man-hours required to make a vest in 10 selected men's winter suit plants, U.S.A., 1950

Plant	Grade	Total	Man-hours per vest					
			Cutting department			Making department		
			Total	Direct	Indirect	Total	Direct	Indirect 1/
A	4	0.966	0.149	0.105	0.044	0.817	0.734	0.083
B 2/								
C 3/								
D	3	.754	.064	.056	.008	.690	.603	.087
E	4	1.417	.165	.107	.058	1.252	1.007	.245
F 4/								
G 3/								
H	5	2.014	.349	.236	.113	1.665	1.386	.279
I	4	1.158	.079	.053	.026	1.079	1.007	.072
J	3+	(3)/	(3)/	(3)/	(3)/	.721	.618	.103

1/ Includes non-department indirect.
2/ Vest made by contractor in 1950.
3/ Data not available.
4/ Two piece suit only.

formed in the other plants; therefore, any comparison of this plant's operations on vests and pants must be made with careful reference to the description of the operation. All plants combined some operations. Caution should be observed when comparing operating times where combinations of operations are involved. The numbers of the operations combined are indicated immediately following the description of the operation or by brackets enclosing the operations. Because of the extensive combinations of operations in vest making, a table similar to 12 and 13 for sack coats and pants is not provided for vests.

Machinery repair and maintenance in the sewing department were similar for all plants studied. Spare machines and parts are kept in stock or on location. For major repairs, the machine head is replaced with a duplicate machine. The machinist then repairs the broken machine in the plant's machine shop.

Several devices are utilized to facilitate the various sewing operations in this department. All the plants use folding attachments which fold piping over edges of cloth and belt fold loops of trousers during the stitching operation. Guides are used to keep stitching an equal distance from the edge of the fabric.

All sewing machines are equipped with finger guards. Generally, experienced workers remove the guards from the sewing machines because they reduce the workers' speed. Button sewing machines are equipped with eye guards.

Table 9. Man-hour requirements and cutting room characteristics in 10 selected men's winter suit plants, U.S.A., 1950 1/

Plant	Grade	Cutting man-hours per suit	Number of operations	Method of spreading	Cutting tables (cloth)	
					Number	Length in feet
A . .	4	0.647	7	2/ H	12	35
B . .	4	.510	7	M	8	Cloth 4-60 Trimming 4-48
C . .	4	.590	6	H 90% M 10%	46	23-80
D . .	3	.386	7	H 50% M 50%	40	15-40
E . .	4	.714	9	3/ H & M	8	Cloth 70 Trimming 50,70
F . .	2+	.502	9	H	34	30-33
G . .	4+	na	7	H 75% M 25%	153	Cloth 55 Trimming 44
H . .	5	1.805	na	H	57	Cloth 21-69 Trimming 7½-45
I . .	4	.628	7	H	10	Cloth 54-70 Trimming 60
J . .	3+	.384	6	M	20	108

na Not available.
1/ Method of marking is by pattern.
2/ H = hand, M = machine.
3/ Hand for plaid, singles and special orders; machine for other cloth.

Inspection is generally a continuous process performed by the foreman and assistant foreman in the various sections of the making department. Usually a thorough check is made of each part before it leaves a section. Final inspection is made in each shop before the garment is sent to the assembly area. Plant H, a producer of a grade 5 garment, spot checks at the following points: foreparts, canvas, first basting, second basting, collar making, sleeve sewing, finishing, buttonhole making, machine pressing, off pressing, and final examination. Each inspection is a visual check for accuracy, neatness, and conformity to specifications. Any garment found to be imperfect or damaged when inspected is sent back to the responsible worker. If damaged cloth is involved and the part has not been assembled, the part will be recut. If the damage is discovered in the completed garment, the fabric is rewoven or the garment is sold as a second.

Table 10. Man-hour requirements and cutting practices in 10 selected men's winter suit plants, U.S.A., 1950

Plant	Grade	Total Cutting time per suit	Method and number of plys cut			
			Suit fabric		Trimmings	
					Body lining	
			Method 1/	Number	Method	Number
A	4	0.647	M	12	M	35
B	4	.510	M	25	M	40
C	4	.860	M	1-40	M	3-70
			H	1-2	H	1-2
D	3	.386	M	15	M	15
E	4	.714	M	3-30	M	40-50
			H	1-2	H	3-4
F	2+	.502	M	3-15	M	50
G	4+	na	H	1	H	1
			M	30	M	40
H	5	1.805	M	50	M	80
			H	2		
I	4	.628	M	28	M	50
J	3+	.384	M	40	M	120

		Method and number of plys cut					
		Trimmings					
		Canvas		Sleeve lining		Pocket lining	
		Method	Number	Method	Number	Method	Number
A	4	Purchased		M	35	M	40
B	4	Purchased		M	40	M	40
C	4	M	100	M	100	M	100
		H	1	H	1	H	1
D	3	Purchased		M	15	M	50
E	4	M	50	M	50	M	50
F	2+	M	50	2/ M	75	M	75
G	4+	H	1	H	1		
		M	100	M	45	M	200
H	5	Purchased		M	100	M	200
I	4	M	50	M	50	M	50
J	3+	M	120	M	65	M	65

na Not available.
1/ H - hand; M - machine.
2/ Some canvas purchased cut.

Table 11. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the cutting department of 10 selected plants, U.S.A., 1950*

Plant A

Operation	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
1. Spreading	Hand	20	20	(1/)
2. Marking	Patterns and chalk			
3. Cutting	H. Maimin round and straight knife			
4. Fitting	Done in making department			
5. Assembling				
6. Ticketing				

1/ Production is planned to make 500 suits per 8-hour day.

Plant B

Operation	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
1. Spreading	CRA Corp., hand-operated	20	17	(1/)
2. Marking	Patterns and chalk			
3. Cutting	Eastman straight and round knife	10		
4. Fitting	Done in making department			
5. Assembling	Hand		1	
6. Ticketing	Soabar machine	20	3	

1/ Production is planned to make about 300 suits per 8-hour day.

* Output shows the performance of the reporting establishment and does not represent the rated capacity of the machinery or equipment.

Table 11. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the cutting department of 10 selected plants, U. S. A., 1950* - Continued

Plant C

Operation	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
1. Spreading and marking	Apex cutting appliances	2 8	48	(1/)
	CRA Corp., hand-operated			
	Hand-spread			
	Patterns and chalk			
2. Cutting	Eastman, Wolf, and Maimin straight and round knife	10	13	Machine: 150 Hand: 8-14
	Maimin drill, model C			
	Hand shears			
3. Fitting	a. Match back and foreparts, small parts		6	200-350
	b. Match lining with sleeve, other matching			
4. Assembling	Hand		3	600
5. Ticketing	Size ticketing: Singer 114-27	5	2	900
	Soabar ticketing	5	4	400

1/ Planned production ranges from 1000-2000 suits per day.

Plant D

Operation	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
1. Spreading	CRA Corp., hand-operated			
	Hand-spread			
2. Marking	Patterns and chalk	na	40	(1/)
3. Cutting	Maimin			
4. Fitting	Hand		2	
5. Assembling	Hand		15	
6. Ticketing	Soabar machine		2	
7. Trimmers	Maimin (lining cutters)		5	

na Not available.

1/ Workers spread, mark and cut in 20 teams of two each. Production is planned to make 1600 suits per day.

Table 11. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the cutting department of 10 selected plants, U. S. A., 1950* - Continued

Plant E

Operation	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
1. Spreading	Hand)		31	(1/)
2. Marking	Patterns and chalk)			
3. Cutting	Eastman straight and round knife)	10		
4. Fitting	Done in making department			
5. Assembling	Done in making department			
6. Ticketing	Soabar machine	10	6	

1/ Production is planned to make from 250 to 300 suits per day.

Plant F

Operation	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
1. Spreading	Hand)		35	(1/)
2. Marking	Patterns and chalk)			
3. Cutting	Maimin, Eastman)	10		
4. Fitting	Done in making department)			
5. Assembling	Hand)		10	
6. Ticketing	Soabar machine)	15		

1/ Production is planned to make from 300 to 400 suits per day.

Table 11. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the cutting department of 10 selected plants, U.S.A., 1950* - Continued

Plant G

Operation	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
1. Spreading	CRA Corp.)	na	51	100
2. Marking	)	na		
3. Cutting	Eastman, Maimin, Beaver, round and straight knife	(1/)	18	200
4. Fitting	Hand		18	200
5. Assembling	Hand		4	1000
6. Ticketing	Soabar model 8 & 9		6	750
7. Ticket sewers	na		2	2500
8. Ticket printers	na		7	900

na Not available.

1/ The average age of all cutting machinery is approximately 3 years with a range of 1 to 10.

Plant H

Operation	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
1. Spreading	CRA Corp.)	6	53	12
2. Marking	Patterns and chalk)			
3. Cutting	Hand shears)			
4. Fitting)	Hand		4	(1/)
5. Assembling)				
6. Ticketing)				
7. Thread marking	Eastman	na	2	(1/)

na Not available.

1/ Production is planned for 500 suits per 8-hour day.

Table 11. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the cutting department of 10 selected plants, U.S.A., 1950* - Continued

Plant I

Operation	Machinery and equipment: Name and model number	Machinery and equipment: Average age	Number of workers	Worker's output per 8-hr. day
1. Spreading	Hand			
2. Marking	Patterns and chalk	8	21	(1/)
3. Cutting	Eastman Hand			
4. Fitting				
5. Assembling				
6. Ticketing	Soabar machine	5	2	(1/)
7. Trimming			5	(1/)

1/ Production is planned for 275 sack coats, 120 vests, and 340 pants per 8-hour day.

Plant J

Operation	Machinery and equipment: Name and model number	Machinery and equipment: Average age	Number of workers	Worker's output per 8-hr. day
1. Spreading	Morrison machine	(1/)		
2. Marking	Gury drilling and notching machine	(1/)	Cloth-61 Trimming-14 Canvas-6 (2/)	
3. Cutting	Wolf Electric Promoting Co., Maimin Rotoshere	(1/)		(3/)
4. Fitting	Done in making department	(1/)		
5. Assembling	None			
6. Ticketing	Singer 114-27	4		

1/ Not available. Machines are on unit drive.

2/ Trimming cutters each mark, spread, and cut material. Cloth cutters work in separate teams; one group does only marking and others do spreading and cutting.

3/ Production is planned to make from 1700 to 2000 suits per day.

Table 12. Man-hour requirements and characteristics of the making department in 10 selected men's winter suit plants, U.S.A., 1950

Plant	Grade	Sewing man-hours per unit			Production method
		Sack coat	Vest	Pants	
A	4	3.866	0.772	0.935	Bundle
B	4	3.919	na	1.045	Bundle
C	4	4.617	na	1.147	Progressive bundle
D	3	3.022	.645	.901	Progressive bundle
E	4	5.162	1.056	1.122	Bundle
F	2+	3.720	na	.988	Bundle
G	4+	4.813	na	.876	Progressive bundle
H	5	4.739	1.439	1.667	Combination
I	4	5.907	1.054	1.153	Bundle
J	3+	2.961	.663	.683	Combination

Table 12. Man-hour requirements and characteristics of the making department in 10 selected men's winter suit plants, U.S.A.1950-Con.

Plant	Grade	Number of operations			Pieces of garments per bundle		Number of	
		Sack coat	Vest	Pants	Average	Range	Models	Styles
A	4	100	50	25	10		6	200
B	4	153	na	53	Coats 25 Pants 35	10-45 10-45	10	150
C	4	110	50	55	35	1-35	10	150
D	3	84	na	39	20-25	1-45	na	na
E	4	150	na	60	Coats 12 Pants 15		10	350
F	2+	115	na	57	Coats 15 Pants 30		25	300
G	4+	100	30	50	25	2-50	15	400
H	5	109	32	53	5	1-20	22	353
I	4	62	20	31	26	3-26	14	200
J	3+	113	40	62	25	40 or less	5	279

na Not available.

Table 13. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the making department of nine selected plants, U.S.A., 1950

Operations on sack coats	Output per worker per 8-hour day, by plant								
	B	C	D	E	F	G	H	I	J
FOREPARTS									
1. Pipe seams	800	300 (1 & 14)*	300–350 (1 & 14)	250 (Turn seams)	300 (1 & 14)	880	280 (Turn seams)	138 (1 & 14)	839
2. Sew darts	300	275	250		200	330		183	492
3. Tape front armhole fore & shoulder	400	275	350	(2 & 3) 135	300	560	(2 & 3) 135	Not done	369
4. Press darts	300	375	400–450	450	400	380	250	183	716
POCKETS									
5. Make welt	600	600	500–600	135 (5 & 8)	600	455	425	138 (5,6 & 7)	
6. Mark welt	1,000	2,400	(Done by pocket maker)	1,200	600	1,100	1,000		
7. Sew on welt	350	175	(7,8,10)	135	250	168	106		
8. Piece pocket	400	750	100	(See 5)	400	455	260	138	
9. Sew on welts	350	Not done	Not done		250	84		Not done	
10. Cut mouth & press open	300 (Sew only; do not press)		(See 7)	65 (9 & 10)		580 (Press open only)	55 (9,10,11)	Not done	64 (5–8,11,12) (9 & 10 Not done)
11. Finish pockets	250 (10 & 11)	50 (10 & 11)	100 (Also tack welt)	250	260 (10 & 11)	455 (Sew around)		55	
12. Baste pocket mouth	Not done	800 (Sew around) 1,200 (Basting)	200	250	300	625	550	Not done	
13. Press pockets	450	1,300	550	450	400	970	500	Not done	811
BACKS									
14. Pipe seams	400	(See 1)	(See 1)	Not done	(See 1)	440	Not done	(See 1)	611
15. Close back seam	900	650	550	250	600	695	480	183	1,261 (14,15,20)
16. Make lining	Not done	(See 33)	100 (16,33–37)	Not done	Not done	(See 33)	300 (Make yoke)	55 (16,33–36)	103 (16,33–37)

See footnotes at end of table.

Table 13. Men's Winter Suits - Continued

Operations on sack coats	Output per worker per 8-hour day, by plant								
	B	C	D	E	F	G	H	I	J
17. Press lining	Not done	(See 38)	425-450 (17 & 38)	Not done	Not done	(See 38)	750 (Press yoke lining)	183	537 (17 & 38)
18. Baste	Not done	(See 50)	150-175 (18, 26, 27)	Not done	Not done	(See 50)	Not done	Not done	95
19. Pair in backs & fore parts	1,000	1,300	1600-1700	500	400	1,817	Not done	275	628
20. Close side seams	500	500	550	250	400	495	250	138	(See 14)
21. Tape back armhole	500	1,300	550	300	400	630		275	985
22. Press side, back & arm holes	350	425	550	400	400	440	(21 & 22) 250	Not done	646
FRONTS									
23. Press canvas	(Buy all pressed)	1,800 (Left and right)	(Buy all pressed)	600	Not done	1,775	600	275 (23 & 29)	2,775
24. Pair in canvas	1,200	650 (Also trim pockets) (24 & 25)	1600-1700		600	1,250 (24 & 25)	600 (Also trim pockets)	275	na
25. Mark break	Not done		Not done	250 (24, 25, 26)			700	Not done	na
26. Canvas foreparts	275	150 (26 & 27)	(See 18)		175 (25, 26, 27)	206 (26 & 27)	175	138 (26 & 27)	304
27. Baste on bridle	650			250			500		1,130
28. Pad lapels & bridle	300	275	200	150	400	470	235	138	430
29. Press fronts	400	1,100 (1 on 4 presses)	1,000	400	500	775 (4 on 2 presses)	600	(See 23)	692
30. Shape	300		150		300	187 (30 & 31)		183 (30 & 31)	310
31. Cut round canvas	400	(30 & 31) 140	800	(30 & 31) 135	500		(30, 31, 54) 90		3,000
32. Pipe bottoms	450	850	800	250 (32 & 48)	500	1,375	600 (Turn bottoms)	275	1,615

See footnotes at end of table.

Table 13. Men's Winter Suits - Continued

Operations on sack coats	Output per worker per 8-hour day, by plant								
	B	C	D	E	F	G	H	I	J
LININGS									
33. Piece up lining	350	190 (16 & 33)			200 (33 & 34)	187 (16 & 33)	175		
34. Piece lining pocket	600	1,000				115 (34–37)			
35. Make lining pocket	200 (35,36,37)	100	(See 16)	40 (33–37)	100 (35,36,37)		100 (34–37)	(See 16)	(See 16)
36. Sew round lining pocket		1,300							
37. Stitch stay		800						Not done	
38. Press lining	450	325 (17 & 38)	(See 17)	300	400	450 (17 & 38)	350	183	(See 17)
39. Pair in lining with coat	500	900	1,600	400	500	1,400	700	275	1,970
40. Baste under	160	110	275	250	150	153	120 (1st basting)	138	202
41. Sew round	275	225	200	135	250	255	160 (Tape sewing incl. gorge)	183	Not done
42. Fasten tapes	700	650	800	250	500	670	265	Not done	369
43. Press tapes	500	Not done	800	500	Not done	960	700	275	1,279
44. Press edge seam open	Not done	525	400	500	500	640	240	183	Not done
45. Trim facings & turn out	200	325	400	250	300	520	230	138	397
46. Baste	250 (46 & 48)	225	200 (Baste edges & bottom)	250	300	325	200	138	294
47. Bluff edges	400	525	550	250	300	500	450	Not done	Not done
48. Fasten bottoms	(See 46)	800	800	(See 32)	500	780	(Baste bottoms)	275	Not done

Table 13. Men's Winter Suits - Continued

Operations on sack coats	Output per worker per 8-hour day, by plant								
	B	C	D	E	F	G	H	I	J
49. Flat baste facing	300	425	250	250	300	560	300	275	532
50. Baste lining	70	180 (Body lining) 140 (Yokes) (Incl. 18)	200	250	100 (50 & 54)	68 (18 & 50)	45	183	1,117 (50 & 51)
51. Fasten facings	500	800	550	250	400	865	600	275	
52. Set edges	Not done	Not done	800	Not done	Not done	800	600	183 (Stitch edges)	Not done
53. Fell lining side seams (S.S.) and bottoms	400 (Fell lining & S.S.) 400 (Fell bottoms)	425	350	125 (Fell lining & S.S.) 125 (Fell bottoms)	300	370	180	183	587 (Side) 1,408 (Bottom)
54. Trim canvas at armhole, shoulder & gorge	400	650	800	250	(See 50)	1,050	(See 31)	138 (Also baste)	929
55. Close shoulders	400	425	400-450	135	400	480	450	275	554
56. Press open shoulders	400	450	550	600	700	485	350	275	821
57. Mark neck inlay	1,000	1,600	800	350	(See 64)	1,125	600 (Pair in collar)	Not done	1,516
58. Seam under-collar and canvas	1,000	1,300	800	250 (58 & 60)	600	1,115	425	275	1,895
59. Press seam	1,000	3,000	Not done	600	1,000	4,900	1,000	(See 61)	5,190
60. Pad under-collar	800	1,300	800	(See 58)	700	1,100	350	275	1,238

Table 13. Men's Winter Suits - Continued

Operations on sack coats	Output per worker per 8-hour day, by plant								
	B	C	D	E	F	G	H	I	J
TOP-COLLAR									
61. Press and stretch top-collar	Not done (Suit has semiopen collar)	1,300 (Press only)	800	250	Not done	2,750	220	275 (59,61,62)	2,513
62. Shape top-collar		(See 66)	Not done		Not done	Not done	(1)/		1,663
63. Pair in top- & under-collar with coat	400	1,000	1,600-1,700	250 (62,63,66)	1,000	420 (63 & 64)	(1)/	275	2,290
64. Baste on under-collar	300	160	1,400	125	95 (57 & 64)		65	138	180
65. Press in under-collar	Not done	560	1600-1700	Not done (See 63)	Not done (Open-collar operation)	4,550	(1)/	Not done	na
66. Shape under-collar	500	90 (Baste top-collar) 90 (Baste collar edge) 110 (Sew gorge) (62 & 66)	550			690	(1)/	275	717
67. Fasten bridles and baste	Not done	215 (67 & 68)	Not done	250	Not done (Open-collar operation)	68	(1)/	92	72 (Collar closing)
68. Draw breaks	Not done		Not done	Not done		430	(1)/	Not done	Not done
69. Fell under-collar	150	90	800 (69 & 70)	85	(See 88)	(See 88)	115	55	1,238
70. Fell collar edge	250	75		125	300	173	125	70	756
SLEEVE									
71. Close forearm seam	800	500	400 (Close front seam)	250	500	765	520	110 (71 & 77)	168 (71,74,75 & 77)
72. Press forearm seam	600	1,300	800	600	500	1,006	680	183 (72 & 78)	897

See footnotes at end of table.

Table 13. Men's Winter Suits - Continued

Operations on sack coats	Output per worker per 8-hour day, by plant							
	B	C	D	E	F	G	H	I	J
73. Tack cuff canvas	Not done	1,600	1600-1700		300	730	na	Not done	1,712
74. Mark & sew vent	400	525	250-275	(73 & 74) 175	(Do not mark)	730	350	Not done	(See 71)
75. Baste cuff	Not done	850	1600-1700 (Baste bottom of sleeve)	250	Not done	780	560	Not done	
76. Press cuff	1,000	1,400	Not done	500	500	2,180	650	Not done	1,497
77. Sew hind-arm seam	300	240	300-350 (Sew elbow seam and tack vent)	250	300	400	195	(See 71)	(See 71)
78. Press hind-arm seam	600	1,050	800 (Elbow seam)	500	500	800	550	(See 72)	824
SLEEVE LINING									
79. Close sleeve lining seams	400	500	350	500	400	525	500	275	746
80. Pair in sleeve lining	500	1,500	1600-1700		Not done (Lining travels with sleeve from outset)	460 (80 & 81)	700	275 (80 & 84)	2,030
81. Tack sleeve lining to cuff	300 (Tack to sleeve seam)	500	400 (Tack to sleeve seam)	250 (80 & 81)	300 (Tack to sleeve seam)		80 (Fell sleeve bottom)	Not done	496
82. Baste sleeve lining to cuff	250	1,000	400 (Fell bottom of sleeves)	250 (82,83,84)	300 (82 & 83)	330	110 (Baste sleeve to seams & lining)	Not done	901
83. Turn & press sleeve	400 (Do not press)	1,600	800		(Do not press)	Not done	Not done	Not done	Not done
84. Pair in sleeve	400	1,300	1600-1700		500	1,600	650	(See 80)	1,765
85. Sew in sleeves	175	90	100	65	135	120	65	110	195
86. Press armhole	275	185	150	165	200	160	175	110	447

na Information not available.

Table 13. Men's Winter Suits – Continued

Operations on sack coats	Output per worker per 8-hour day, by plant								
	B	C	D	E	F	G	H	I	J
87. Baste armhole & insert pad	65	75(Basting) 50(Tacking)	150	65(Baste) 125(Insert)	90	64	28(Baste) 240(Insert)	110(Baste) 46(Insert)	106
88. Felling	30	40(Fell body) 40(Top sleeves)	30–40	16	20 (69 & 88)	35 (69 & 88)	16	16	na
89. Mark and cut buttonholes	450	1,200 (Mark only)	800	600		870	500	275	1,449(Lapel buttonhole)
90. Make buttonholes	40	24	400	25	(89 & 90) 300	32	24	28	747
91. Pull bastings	50	60	100	65	110	93	70	70	1,249
92. Press edges	400	385	350	250	300	440	270	138	462
93. Press collars and shapes	300	300	140	250 (93 & 94)	300	255	160 (93 & 94)	138 (93 & 94)	209 (93 & 103)
94. Remove impressions of collar & shape	300 (94 & 103)	470	200 (94 & 97)		300	108 (94 & 102)			95 (94 & 102)
95. Press fronts	300	400(Left & rt.)	175	250	300	390	210	Not done	292
96. Mark and sew buttons	400 (Mark) 150 (Sew)	50	550	50	80	152	na	275 (Mark) 55 (Sew)	1,430 (Mark) 234 (Sew)
97. Press elbows	Not done	500	(See 94)	45 (97,98 & 102)	300	88 (97,98,99 & 100)	320	38 (97,98, 99,100 & 101)	727
98. Press sleeves	500	285	120 (98,99, & 100)		150 (98,99, & 100)		Not done		496
99. Press sideseams	200 (99&100)	480		250 (99 & 100)			200 (99&100)		129 (99 & 100)
100. Press backs		500							
101. Press shoulders & armholes	120	85	68	250	130	86	24		94
102. Touch up with hand-irons	75	52	144	(See 97)	100	(See 94)	150	(102,103) 28	(See 94)
103. Roll lapels	(See 94)	480	550	250	300	510	Not done		(See 93)

* Numbers in parentheses are operation numbers.
na Not available.
1/ Other operations on top-collar not comparable.

Table 14. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the making department of eight selected plants, U.S.A., 1950

Operations on pants	Output per worker per 8-hour day, by plant 1/							
	B	C	D	E	F	G	I	J
FRONTS								
1. Serge in & out leg seams & fork run, taking in fork stay	200	200 (1,12)*	650	300 (1,12)	300 (1,12)	632	340	940
2. Sew in pleats	400	Baste 800 Tack -240	800	300	500	550	Not done	na
3. Press pleats	400	Not done	Not done	300 (3,14,26)	(See 52)	(See 26)	Not done	2330
4. Sew on pocket facing, turning in: (Bottom of facing shaped)	400	225	400	300	900	450	340 (4,30)	1040
5. Sew pockets & facing to front: nick seam at both ends of stitching	100 (5,6,7,31)	200	Not done	80 (5,7,30,31)	400	396 (5,31)	100 (5,6,7,31)	167 (5,6,7)
6. Turn back, pipe, turn in and sew down inside edge of pocket facing	(See 5)	500	Not done	100 (6,17,19, 21,22)	90 (6,17,19)	760	(See 5)	(See 5)
7. Sew pocket, tack mouth top & bottom nick facing of pocket below bottom; tack & pair off surplus facing at top	(See 5)	500 (Close front pockets) 350 (Tack front pockets)	Not done	(See 5)	300	275	(See 5)	(See 5)

See footnotes at end of table.

Table 14. Men's Winter Suits - Continued

Operations on pants	Output per worker per 8-hour day, by plant 1/							
	B	C	D	E	F	G	I	J
8. Sew zip to left fly on twin needle taking in lining; sew right fly to zip	400	1200 (Sew zip to left fly only)	1000	200 (8,9)	700 (8,9)	800	230 (8,9)	1900 1510
9. Trim zip level with top of fly; sew jean stay to left fly top	Not done	Not done	Not done	(See 8)	(See 8)	(See 25)	(See 8)	Not done
10. Sew fly lining to right fly	400 (10&36)	800	2000	300 (10,11)	450 (10,11,36)	1844	340	615 (10,11)
11. Nick front for fly; sew left fly to front	400	275	Not done	(See 10)	(See 10)	640	340	(See 10)
BACKS								
12. Serge in & out leg seams, taking pocket stay on side seam; serge seat seam	200	(See 1)	650	(See 1)	(See 1)	632	340	1642 869
13. Sew darts	700	1200	650	500	600	344	340	Not done
14. Press darts	700	1600	1000	(See 3)	700 (14,15)	910	340	Not done
15. Mark hip pockets	1000	1400	1000	(See 16)	(See 14)	1880	Not done	na

See footnotes at end of table.

Table 14. Men's Winter Suits - Continued

Operations on pants	Output per worker per 8-hour day, by plant 1/							
	B	C	D	E	F	G	I	J
16. Lay pocket, back & facing with drilled holes in pocketing in line with hip pocket mark; sew across on twin needle m/c with knife between needles cutting as sewing	500	400	Not done	300 (15,16)	Not done	285 (Cut by hand)	85 (16,17,18 19)	179
17. Make bottom welt; turn in facing & sew down in pocket	125 (17,18,19)	450	100	(See 6)	(See 6)	(See 19)	(See 16)	na
18. Sew each side of pocket, using knife trimmer	(See 17)	450	Not done	Not done	Not done	Not done	(See 16)	na
19. Turn out hip pocket; catch ends; insert tab on left hip only; loop for button	(See 17)	300	Not done	(See 6)	(See 6)	285 (19,17)	(See 16)	na
20. Mark & sew button to hip pocket (L).	1500	1200	Not done	600 (20,41)	1200	50	170 (20,32)	2480
21. Sew round hip pocket	400	850	650	(See 6)	900	730	340	666
22. Pair in backs & fronts insert garment ticket, in hip pocket	Not done	1400	2000	(See 6)	(See 23)	1500	Not done	na

See footnotes at end of table.

Table 14. Men's Winter Suits - Continued

Operations on pants	Output per worker per 8-hour day, by plant 1/							
	B	C	D	E	F	G	I	J
23. Close side seams from top to bottom	300	250	300 (23,31)	300	500 (22,23)	235 (23,44)	136	642
24. Make belt loops for waistband	1500	1200	1000	300 (24,29)	800	1700	340	2419
25. Sew on waistband, including 6 or 7 belt loops	300	225	350	300	2/ 500	256 (25,9)	136 (25,27)	280
26. Press open seam at pocket mouth turn over & press down lip of pocket, press over right fly seam, press back left fly	400	250 (Press inside seam, outside seam and waistband seam) 1800 (Press fly)	500	1000 (Press waistband seam) (See 3 for remaining operations)	600	1005 (26,3)	220	994 (Press waistband) 1228 (Press fly)
27. Bar-tack loops on waistband, side pockets, hip pockets	400	160 (27,43)	300 (27,43)	300	400 (27,48)	480 (27,48)	(See 25)	685
28. Sew round side pocket; close pocket to stay	400	400	500	500	650	548	340	705
29. Serge left fly	2000	1800	2000	(See 24)	1600	2480	Not done	2090
30. Make watch by serging machine	Not done	1600(Do not serge)	2000	(See 5)	Not done	1600	(See 4)	3104
31. Sew on watch pocket to top of waistband	(See 5)	400	(See 23	(See 5)	900	(See 5)	(See 5)	na
32. Put in snaps on waistband	Not done	1800	2000 (Make top buttonhole)	Not done	Not done	Not done	(See 20)	2030 2045

See footnotes at end of table.

Table 14. Men's Winter Suits - Continued

Operations on pants	Output per worker per 8-hour day, by plant 1/							
	B	C	D	E	F	G	I	J
33. Corner left and right flys	400	400 (left fly only, See 36)	2000 (Sew on top button)	300 (33,36)	350 (33,34)	192 (33,34,35)	170 (33,34,36)	1025 (33,34)
34. Fell on waist-band lining	600	500	Not done	300 (34,47)	(See 33)	(See 33)	(See 33)	(See 33)
35. Sew side of watch pocket to waistband lining	Not done	750	Not done	Not done	Not done	(See 33	Not done	Not done
36. Sew on edge of right fly to waistband lining	(See 10)	600 (Incl. 2nd half of 33)	2000	(See 33)	Not done	600	(See 33)	na
37. Press waistband lining & press seam of right fly lining	400	500 (37& 39)	650	500	600	380	230	962
38. Stitch left fly	400	600	(See 42)	Not done	(See 40)	720	(See 42)	1036
39. Check waist measure	(See 40)	(See 37)	2000	(See 40)	(See 40)	(See 40)	(See 40)	na
40. Sew back seam, beginning 3 in. from crotch & make vent	400 (39,40 & 45)	500 (40 & 45)	650	150 (39,40)	300 (38,39,40)	370 (39,40,45)	340 (39,40)	946 (Make vent) 1990
41. Sew on 6 suspender buttons, inserting button stay to each	400	800	1000	(See 20)	900	1400	340	Not done
42. Stitch down waistband lining & close right fly edge	400	250	300 (42 & 38)	300	350	270	136 (42,38)	na

See footnotes at end of table.

Table 14. Men's Winter Suits - Continued

Operations on pants	Output per worker per 8-hour day, by plant 1/							
	B	C	D	E	F	G	I	J
43. Bar tack loops thru waistband	400	(See 27)	(See 27)	300 (43,46)	500	310	115	652
44. Close in-leg seams	400	400	500	300 (44,45)	500 (44,45)	(See 23)	340	417
45. Close crotch seam	(See 40)	(See 40)	Not done	(See 44)	(See 44)	(See 40)	Not done	853
46. Put on zip runner & staple end of zip	400	1500 (Put on zip runner only)	1000	(See 43)	800	880	340	1132 2260
47. Tape crotch	Not done	700	Not done	(See 34)	800	800	340	396
48. Bar tack fly	800	1400 (Bar tack crotch)	2000	300	(See 27)	(See 27)	340	2177
49. Press side seam in-leg seams, & back seams	500	900 (Press back seams only)	500	500	700	365	Not done	573
50. Clean, sew on tickets & remove Soabar tickets	200	250	125	150	175 (Clean & remove tickets) 600 (Sew on tickets)	160	100	536
51. Press legs	300	400	400	250	400	324	340	481
52. Press round top	300	370	400	225	350 (52, 3)	265	340	531
53. Pink bottoms	Not done	2400	2000	Not done	850	2500	Not done	na
54. Examine and clean stains	400	225	400	300	800	184	340	na

* Numbers in parentheses are operation numbers.
na Not available.
1/ Operations for plant H are not comparable to those of the other plants.
2/ Sew loops only. Hollywood style waist.

Table 15. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the making department of nine selected plants, U.S.A., 1950

Plant B* - Men's Winter Suits

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
FOREPARTS					
1. Pipe seams.	Singer 241-2	8	L	2	800
2. Sew darts.	Singer 96-10	20	L	1	300
3. Tape front armhole fore and shoulder.	Singer 96-10	20	L	1	400
4. Press darts.	New York Press, Slide Arm Jumper	9	U	1	300
POCKETS					
5. Make welt	Singer 96-10	20	L	1	600
6. Mark welt	Hand-Metal Template			1	1,000
7. Sew on welt	Singer 96-10 (Breast pocket)	20	L	1	350
8. Piece pocket	Singer 96-10	20	L	1	400
9. Sew welt	Singer 96-10 (Sidepocket piping)	20	L	1	350
10. Cut mouth, sew and open	Singer 96-10	20	L	1	300
11. Finish pockets	Singer 96-10	20	L	1	250
12. Baste pocket mouth	Not done				
13. Press pockets	Hoffman TP1 2 machines	3	U	1	450
BACKS					
14. Pipe seams	Singer 241-2	7	L	1	400
15. Close back seam	Singer 241-12	7	L	1	900
16. Make lining	Not done				
17. Press lining	Not done				
18. Baste	Not done				
19. Pair in back and forepart	Hand			1	1,000
20. Close side seams	Singer 241-12	7	L	1	500
21. Tape back armhole	Union Special 90292	5	L	1	500

*Plant B - This plant employs between 250 and 300 workers. It is an inside shop using the bundle system of production, and manufactures grade 4 men's suits, topcoats, and overcoats. The plant comprises a cutting and making department; sponging, shrinking, and finishing are done by contract. Worker's output is based on actual production time. Production is planned to make about 300 suits per day.

Footnotes at end of table.

Plant B - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
22. Press side back and armholes	Hoffman Slide Arm	7	U	1	350
FRONTS					
23. Press canvas	Purchased				
24. Pair in canvas	Hand			1	1,200
25. Mark break	Not done				
26. Baste canvas foreparts	Singer 12W211	20	U	1	275
27. Baste on bridle	Singer 12W208	20	U	1	650
28. Pad lapels and bridle	American Blind-stitch	4	L		
29. Press fronts	Hoffman MXT-S1 2 machines	3	U	1	400
30. Shape	Hand			1	300
31. Cut round canvas	Hand			1	400
32. Pipe bottoms	Singer 241-2	7	L	1	450
LINING					
33. Piece up lining	Singer 96-10	20	L	1	350
34. Piece lining pocket	Singer 96-10	20	L	1	600
35. Make lining pocket) 36. Sew round lining pocket) 37. Stitch stay)	Singer 96-10 2 perform all operations	20	L	2	200
38. Press lining	Hoffman - BC01	10	U	1	450
39. Pair in lining with coat	Hand			1	500
40. Baste under	Hand			2	160
41. Sew round	Singer 245-4	7	L	1	275
42. Fasten tapes	U.S. Blind stitch B88	15	L	1	700
43. Press tapes	Hoffman TP1, 2 machines	30	U	1	500
44. Press edge seam open	Not done				
45. Trim facings and turn out	Hand			1	200
46. Baste (46,48)	American Edge Baster	1	L	1	250
47. Bluff edges	Lewis Lockstitch 24	25	L	1	400

Footnotes at end of table.

Plant B - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
48. Fasten bottoms	(See 46)				
49. Flat baste facing	Singer 12W208	20	U	1	300
50. Baste lining	Hand			4	70
51. Fasten facings	U.S. Blindstitch 89	3	L	1	500
52. Set edges	Not done				
53. Fell lining side seams	Lewis Lockstitch 30-21	6	L	1	400
& bottoms	Lewis Lockstitch 16	20	L	1	400
54. Trim canvas					
55. at armhole, shoulder and gorge	Hand			1	400
55. Close shoulders	Singer 241-2	7	L	1	400
56. Press open shoulders	New York Press, Slide Arm	4	U	1	400
57. Mark neck inlay	Hand				1,000
58. Seam under-collar and canvas	Singer 96-10	20	L	1	1,000
59. Press seam	New York Press BF32	7	U	1	1,000
60. Pad under-collar	U.S. Blindstitch B88	20	L	1	800
TOP-COLLAR					
61. Press and stretch top-collar	Not done (Semi-open collar)				
62. Shape top-collar	Not done				
63. Pair in top-and under-collar with coat	Hand			1	400
64. Baste on under-collar	Hand			1	300
65. Press in under-collar	Not done				
66. Shape under-collar	Hand			1	500
67. Easten bridles and baste	Not done				
68. Draw breaks	Not done				
69. Fell under-collar	Hand			2	150
70. Fell collar edge	Hand			2	200
SLEEVE					
71. Close forearm seam	Singer 96-10	20	L	1	800
72. Press forearm seam	New York Press, G16	7 7	U	1	600

Footnotes at end of table.

Plant B - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day [2/]
	Name and model number	Average age	Drive		
73. Tack cuff canvas	Not done				
74. Mark & sew vent	Singer 96-10	20	L	1	400
75. Baste cuff	Not done				
76. Press cuff	Hoffman TDO	30	U	1	1,000
77. Sew hindarm seam	Singer 241-12	7	L	1	300
78. Press hindarm seam	New York Press, G16	7	U	1	600
SLEEVE LINING					
79. Close sleeve lining seams	Singer 96-10	20	L	1	400
80. Pair in sleeve lining	Hand				500
81. Tack sleeve lining to seam	Singer 96-10	20	L	1	300
82. Baste sleeve lining to cuff	Hand			1	250
83. Turn and press sleeve	New York Press, G16	10	U	1	400
84. Pair in sleeves	Hand			1	400
85. Sew in sleeves	Singer 241-2	7	L	1	175
86. Press armhole	New York Press, G2	20	U	1	275
87. Baste armhole and insert pad	Hand			4	65
88. Felling armhole, shoulder and cuff	Hand			12	30
89. Mark and cut buttonholes	Mark by hand and cut by foot-press			1	450
90. Make buttonholes lapel and 2 fronts	Hand			9	40
91. Pull bastings	Hand			7	50
92. Press edges	Hoffman TDO	30	U	1	400
93. Press collars and shapes	New York Press, NA7L	20	U	1	300
94. Remove impressions of collar & shapes (94,103)	New York Press, N240	15	U	1	300
95. Press fronts	Hoffman B021	15	U	1	300
96. Mark and sew buttons	Hand Mark buttons Sew buttons			1	150

Footnotes at end of table.

Plant B - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
97. Press elbows.	Not done				
98. Press sleeves.	Hoffman BU4	2	U	1	500
99. Press side seams.	Hoffman BU4	2	U	2	200
100. Press backs.	(By same workers)				
101. Press shoulders and armholes.	Hoffman VG5	2	U	2	120
102. Touch up with Hand Iron.	Koenig Gas Hand Iron			3	75
103. Roll lapels.	(See 94)				

1/ L - line drive, U - unit drive.
2/ Output shows the performance of the reporting establishment and does not represent the rated capacity of the machinery or equipment.

Plant B - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
FRONTS					
1. Serge in and cut leg seams and fork run, taking in fork stay.	Merrow High Speed	10	L	1	200
2. Sew in pleats.	Singer 400W10	3	L	1	400
3. Press pleats.	Koenig Hand Iron	na		1	400
4. Sew on pocket facing, turning in; (bottom of facing shaped).	Singer 96-10	20	L	1	400
5. Sew pockets and facing to front; nick seam at both ends of stitching.)	Singer 96-10, (5,6,7 and 31)	20	L	(5,6, 7 and 31)	100
6. Turn back, pipe, turn in and sew down inside edge of pocket facing.)					

Footnotes at end of table.

Plant B - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
7. Sew pocket, tack mouth top and bottom nick facing of pocket below bottom; tack and pair off surplus facing at top)					
8. Sew zip to left on twin needle taking in lining; sew right fly to zip.	Singer 112W140	15	L	1	400
9. Trim zip level with tip of fly; sew jean stay to left fly top.	Not done				
10. Sew fly lining to right fly (10,36)	Singer 96-10	10	L	1	400
11. Nick front for fly; sew left to fly to front.	Singer 96-10	10	L	1	400
BACKS					
12. Serge in and cut leg seams, taking in pocket stay on side seam; serge seat seam.	Merrow High Speed	10	L	1	200
13. Sew darts.	Singer 96-10	20	L	1	700
14. Press darts.	Koenig Hand Iron	na		1	700
15. Mark hip pockets.	Hand			1	1,000
16. Lay pocket, back and facing with drilled holes in pocketing in line with hip pocket mark; sew across on twin needle m/c with knife between needles cutting as sewing.	Singer 112W127 (with knife attachment)	3	L	1	500
17. Make bottom welt; turn in facing and sew down in pocket.)	Singer 96-10	20	L	1	125
18. Sew each side of pocket, using knife trimmer.)					

Footnotes at end of table.

Plant B - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
19. Turn out hip pocket; catch ends; insert tab on left hip only; loop for button.					
20. Mark and sew button to hip pocket (L).	Mark by hand and sew by machine Singer 175-60	3	L	1	1,500
21. Sew round hip pocket.	Singer 241-2	7	L	1	400
22. Pair in backs and fronts insert garment ticket in hip pocket.	Not done				
23. Close side seams from top to bottom.	Singer 241-2	7	L-	1	300
24. Make belt loops for waistband.	Union Special (with attachment)	20	L	1	1,500
25. Sew on waistband, including 6 or 7 belt loops.	Singer 241-2	7	L	2	300
26. Press open seam at pocket mouth, turn over and press back left fly.	Zacharias Slide Arm	20	U	1	400
27. Bar-tack loops on waistband, side pockets, hip pockets.	Singer 68-3	15	L	1	400
28. Sew round side pockets close pockets to stay.	Singer 241-2	7	L	1	400
29. Serge left fly.	Merrow High Speed	10	L	1	2,000
30. Make watch pocket by serging machine.	Not done				
31. Sew on watch pocket to top of waistband.	(See 5)				
32. Put in snaps on waistband.	Not done				

Footnotes at end of table.

Plant B - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
33. Corner left and right flys.	Singer 241-2	7	L	1	400
34. Fell on waistband lining.	Union Special	10	L	1	600
35. Sew side of watch pocket to waistband lining.	Not done				
36. Sew on edge of right fly to waistband lining.	(See 10)				
37. Press waistband lining and press seam of right fly lining.	Zacharias	20	U	1	400
38. Stitch left fly.	Singer 96-10	20	L	1	400
39. Check waist measure.					
40. Sew back seam, beginning 3 in. from crotch and make vent (40,45).	Singer 96-10	20	L	1	400
41. Sew on 6 suspender buttons, inserting button stay to each.	Singer 175-60	3	L	1	400
42. Stitch down waistband lining and close right fly edge.	Lewis Lockstitch 16	3	U	1	400
43. Bar-tack loops thru waistband.	Singer 68-3	15	L	1	400
44. Close in-leg seams.	Singer 241-12	7	L	1	400
45. Close crotch seam.	(See 40)				
46. Put on zip runner and staple end of zip.	Kohinoor Zipper Machine	1	Foot pedal	1	400
47. Tape crotch.	Not done				
48. Bar-tack fly.	Singer 69-3	7	L	1	800
49. Press side seam, inleg seams, and back seams.	Zacharias Press Jumper	15	U	1	500
50. Clean, sew on tickets, and remove Soabar tickets.	Hand			2	200

Footnotes at end of table.

Plant B - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
51. Press legs.	New York Press NL4	10	U	2	300
52. Press round top.	New York Top Presser	10	U	1	300
53. Pink bottoms.	Not done				
54. Examine and clean stains.	Hand			1	400

na Not available.

1/ L - line drive, U - unit drive.

2/ Output shows the performance of the reporting establishment and does not represent the rated capacity of the machinery or equipment.

Table 15. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the making department of nine selected plants, U.S.A., 1950

Plant C* - Men's Winter Suits

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
FOREPARTS					
1. Pipe seams	Singer 241-12	2	U	5	300
2. Sew darts	Singer 241-12	2	U	4	275
3. Tape front armhole fore and shoulder	Singer 96-21	20	U)	5	275
	Singer 96-10	20	U)		
	Singer 96-87	20	U)		
4. Press darts	Hoffman Jumper	15		5	375
POCKETS					
5. Make welt	Union Special 61-300B	1-1/2	U)	2	600
	Singer 241-12	1-1/2	U)		
6. Mark welt	Hand			1	2,400
7. Sew on welt	Singer 96-40	15	U)	6	175
	Singer 96-10	15	U)		
8. Piece pocket	Singer 96-10	20	U	2	750
9. Sew on welts	Not done				
10. Cut mouth press open	(See 11)				
	Hoffman Jumper	18		1	900
11. Finish pockets (10 & 11)	Singer 96-21	20			
	Singer 31-15	1-1/2	U	25	50
	Singer 96-10	20			
12. Baste pocket mouth	Singer 96-18 (Sewing around)	15	U)	2	800
	Singer 55-5 (Basting)	15	U)		1,200
13. Press pockets	Hoffman, 3 machines	30		1	1,300
BACKS					
14. Pipe seams	(See 1)				
15. Close back seam	Singer 96-21	15	U)	2	650
	Singer 96-40	15	U)		
16. Make lining	(See 33)				
17. Press lining	(See 38)				

*Plant C - This plant employs over 1,000 workers. It is an inside shop using the progressive bundle system of production, and manufactures grade 4 suits and slacks. The plant comprises sponging, shrinking, finishing; trimming; Soabar, assembly and fitting; making; packing and shipping departments. Workers' output is based on actual time. Planned production ranges from 1,000 to 2,000 suits per day.

Footnotes at end of table.

Plant C - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
18. Baste	(See 50)				
19. Pair in back & foreparts	Hand			1	1,300
20. Close side seams	Union Special 61400-A	1-1/2	U	3	500
21. Tape back armhole	Union Special 6500-Z	20	U	1	1,300
22. Press side back & armholes	Hoffman Jumper	18		3	425
FRONTS					
23. Press Canvas	Hoffman(Right) (Left)	20 20		2	1,800
24. Pair in canvas)	Hand, also trim pockets			2	650
25. Mark break)					
26. Canvas foreparts)	Singer 12W-215	12	U	9	150
27. Baste on bridle)					
28. Pad lapel and bridle	American Blind Stitch	8	U	5	275
29. Press fronts	Hoffman (1 worker operates 4 presses)	3		1	1,100
30. Shape)	Hand			11	140
31. Cut round canvas)					
32. Pipe bottoms	Singer 96-40 Singer 96-10	15) 15)	U	2	850
LINING					
33. Piece up lining (33, 16)	Union Special 61-400AZ	1-1/2	U	8	190
34. Piece lining pocket	Union Special 61-400AZ	1-1/2	U	2	1,000
35. Make lining pocket	Union Special 61-400AZ	1-1/2	U	14	100
36. Sew round lining pocket	Singer 96-18	15	U	1	1,300
37. Stitch stay	Singer 96-10 Singer 96-2	15) 15)	U	2	800
38. Press lining (38, 17)	Hand Iron			4	325
39. Pair in lining with coat	Hand			1	900
40. Baste under	Hand			13	110
41. Sew round	Singer 245-4 Singer 96-18	1 20	U) U)	6	225

Footnotes at end of table.

Plant C - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
42. Fasten tapes	American Blindstitch	4	U	2	650
43. Press tapes	Not done				
44. Press edge seam open	New York Press Hoffman Jumpers	5) 15)		3	525
45. Trim facings and turn out	Hand			4	325
46. Baste	Singer 24-33	30	U	6	225
47. Bluff edges	American Blindstitch model 9 Lewis 54-2	2 2	U) U)	2	525
48. Fasten bottoms	Lewis Lockstitch 170X-2	1	U	2	800
49. Flat baste facing	Singer 12W-215 Singer 12W-211	2 15	U) U)	4	425
50. Baste lining (50, 18)	1) Singer 12W-215, Body lining	2	U	7	180
	2) Hand, Yokes			10	140
51. Fasten facings	Lewis 43-24	1	U	2	800
52. Set edges	Not done				
53. Fell lining side seams & bottoms	Lewis 30-21	3	U	3	425
54. Trim canvas at armhole, shoulder and gorge	Hand			2	650
55. Close shoulders	Singer 96-87 Singer 96-10 Singer 96-40	20	U U U	3	425
56. Press open shoulders	Hoffman Jumpers	18		3	450
57. Mark neck inlay	Hand			1	1,600
58. Seam under-collar and canvas	Singer 96-21	20	U	1	1,300
59. Press seam	Hoffman	18		1	3,000
60. Pad under-collar	American Blindstitch model 9	14	U	1	1,300
TOP-COLLAR					
61. Press top-collar	Hoffman	20		1	1,300
62. Shape top-collar	(See 66)				
63. Pair in top and under-collar with coat	Hand			1	1,000
64. Baste on under-collar	Hand			8	160

Footnotes at end of table.

Plant C - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
65. Press in under-collar	New York Press Model Rk 21	1		3	560
66. Shape under-collar	(Baste top-(collar, hand			14	90
	(Baste collar (edge, hand			14	90
	(Sew gorges, (hand			12	110
67. Fasten bridles) and baste)	Hand			6	215
68. Draw breaks)					
69. Fell under-collar	Hand			14	90
70. Fell collar edge	Hand			18	75
SLEEVE					
71. Close fore-arm seam	Union Special 61-400AZ	1-1/2	U	3	500
72. Press fore-arm seam	Hoffman Jumper	20		1	1,300
73. Tack cuff canvas	American Blind-stitch Model 9	1	U	1	1,600
74. Mark & sew vent	Singer 96-2	15	U	3	525
75. Baste cuff	Singer 24-33	20	U	2	850
76. Press cuff	Hoffman	25		1	1,400
77. Sew hind-arm seam	Singer 96-10	10	U	5	240
78. Press hind-arm seam	Hoffman	18		1	1,050
SLEEVE LINING					
79. Close sleeve lining seams	Singer 241-12	1-1/2	U	3	500
80. Pair in sleeve lining	Hand			1	1,500
81. Tack sleeve lining to cuff	Singer 55-5	20	U	3	500
82. Baste sleeve lining to cuff	Singer 107-1	20	U	2	1,000
83. Turn sleeve	Hand			1	1,600
84. Pair in sleeves	Hand			1	1,300
85. Sew in sleeves	Singer 96-18 (12 machines) Singer 47-W10 (4 machines)	22	U	16	90
86. Press armhole	Hoffman Jumper	18		7	185
87. Baste armhole	Basting, Hand			18	75
Insert pad	Included in making fronts			25	50

Footnotes at end of table.

Plant C - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
88. Felling	Hand				
	(Bodies			41	40
	(Top Sleeves			45	40
89. Mark buttonholes	Hand			1	1,200
90. Make buttonholes 3/	Hand			68	24
91. Pull bastings 4/	Hand			28	60
92. Press edges	Hoffman (each worker operates 2 presses)			4	385
93. Press collars and shapes	New York Press-Jumpers	2		6	300
94. Remove impressions of collar and shapes	Hoffman	15		5	470
95. Press fronts	Hoffman, left and right (4 sets)	2		4	400
96. Mark & sew buttons	Hand			25	50
97. Press elbows	Hoffman	15		4	500
98. Press sleeves	Hoffman	15		5	285
99. Press side-seams	Hoffman	15		4	480
100. Press backs	Hoffman	15		3	500
101. Press shoulders and armholes	Hoffman	15		21	85
102. Touch up with hand iron	Hand Iron			32	52
103. Roll lapels	Hoffman	15		4	480

1/ L - line drive, U - unit drive.

2/ Output shows the performance of the reporting establishment and does not represent the rated capacity of the machinery or equipment.

3/ This firm performs an overcasting operation by machine which cuts the buttonhole at the same time. The "overcasting buttonholes" operation utilizes three Reece Buttonhole Machines (unit drive), on a rental basis, changed periodically as required. There are three operators, two on fronts, 650 coats per worker-day; and one on lapels, 1,300 coats per worker-day.

4/ After operation 91, this firm performs an operation called "brushing" utilizing 14 operators, 100 coats output per worker-day.

Plant C - Men's Winter Suits - Continued

Operations on vests	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
FOREPARTS					
1. Sew darts	Singer 96-10		L	1	400
2. Press darts and welts	Jasper Sunshine	30		1	600
3. Trim welts	Hand			1	600
4. Make welts	Singer 96-10(2) Singer 96-40(1)		L	3	200
5. Sew on welts	Singer 96-10		U	3	200
6. Cut open pocket mouth	Hand			1	600
7. Press open welt seams	Jasper Sunshine	30		1	600
8. Tack pockets	Singer 96-10(3) Singer 96-18(1)		U	3	200
9. Sew round welt pockets	Singer 95-12		U	1	600
10. Baste canvas by machine	Singer 24-33		U	1	600
11. Press foreparts	Not done				
12. Trim canvas and shape bottom	Hand			1	500
13. Mark shape, assemble lining and front	Hand			1	500
14. Baste under by machine	Singer 24-33		U	1	500
15. Baste armhole by hand	Hand			1	650
16. Join neck	Singer 31-15		U	1	1,200
16a. Sew tape	Singer 96-18 & Singer 96-48			2	250
17. Pull bastes and turn vests	Hand			1	600
18. Baste edges	Singer 24-33		U	2	275
19. Press shoulder pleats (19, 22)	Jasper Sunshine	30		1	800
20. Baste sides and shoulders	Singer 24-33		U	1	1,000
21. Trim sides and shoulders	Hand			1	1,000
22. Press front edges	(See 19)				
23. Join backs and fronts	Hand			1	3,000
24. Join sides and shoulders	Singer 96-10(2) Singer 96040(2)		U	4	200

Footnotes at end of table.

Plant C - Men's Winter Suits - Continued

Operations on vests	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
25. Fell necks	Hand			4	150
26. Remove size ticket	Hand			1	3,000
27. Mark buttonholes	Hand			1	2,000
28. Make buttonholes	Reece Cutafter	10	U	1	500
29. Bar tack, if machine hole	Singer 68-10	15	U	1	900
30. Baste backs	Not done				
31. Stitch backs	Not done				
32. Pull bastes from backs	Not done				
33. Press-off backs 3/	Hoffman	25		1	450
34. Press-off fronts	Hoff, right, left & neck	25		1	600
35. Mark for and count buttons	Hand			1	1,000
36. Sew on buttons	Hand			5	125
36a. Sew on tickets	Singer 114-31	1	U	3	1,400
37. Brush and clean	Hand			2	350
LININGS					
38. Make linings 4/	Singer 241-12	2	U	1	500
BACK					
39. Make backs (1st operation)	Singer 96-10	15	U	2	300
40. Make backs (2nd operation)	Singer 96-10	15	U	1	700
41. Press backs	Not done				

1/ L - line drive, U - unit drive.

2/ Output shows the performance of the reporting establishment and does not represent the rated capacity of the machinery or equipment.

3/ After operation 33, this firm performs an operation referred to as "retouch lining by hand," one operator, 450 vests per worker-day.

4/ After operation 38, this firm performs an operation referred to as "press linings," Jasper Sunshine Machine, one operator, 700 vests per worker-day.

Plant C - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
FRONTS					
1. Serge in & out leg seams & fork run, taking in fork stay(1, 12)	Wilcox & Gibbs (Super Lock-DF)	8	L	11	200
2. Sew in pleats					
(Baste	Singer 55-5	10	L	3	800
(Tack	Singer 96-10	12	L	9	240
3. Press pleats					
4. Sew on pocket facing, turning in; (bottom of facing shaped)	Singer 96-10	12	L	9	225
5. Sew pockets & facing to front; nick seam at both ends of stitching	Singer 96-40	10	U	10	200
6. Turn back, pipe, turn in & sew down inside edge of pocket facing	Singer 96-41	8	L	4	500
7. Sew pocket, tack mouth top & bottom nick facing of pocket below bottom; tack & pair off surplus facing at top.	(1)Close front pockets Singer 96-45	12	L	4	500
	(2)Tack front pockets Singer 31-15	30	L	6	350
8. Sew zip to left fly	Singer 112W-115	10	U	2	1,200
9. Trim zip level with top of fly; sew jean stay to left fly top	Not done				
10. Sew fly lining to right fly	Singer 112W-115	10	U	3	800
11. Nick front for fly; sew left fly to front	Singer 96-40		L	7	275
BACKS					
12. Serge in & cut leg seams, taking in pocket stay on side seam; serge seat seam	(See 1)				

Footnotes at end of table.

Plant C - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
13. Sew darts	Singer 96-10	15	L	2	1,200
14. Press darts	Jasper-Sunshine	25		2	1,600
15. Mark hip pockets	Hand			2	1,400
16. Lay pocket, back & facing with drilled holes in pocketing in line with hip pocket mark; sew across on twin needle m/c with knife between needles cutting as sewing	Singer 112W-127	5	L	5	400
17. Make bottom welt; turn in facing & sew down in pocket	Singer 96-41	10	L	4	450
18. Sew each side of pocket, using knife trimmer	Singer 96-45	10	L	5	450
19. Turn out hip pocket; catch ends; insert tab on left hip only; loop for button	Singer 96-10	15	L	6	300
20. Mark & sew button to hip pocket(L)	Singer 114-35	15	U	2	1,200
21. Sew round hip pocket	Singer 96-10	15	L	3	850
22. Pair in backs & fronts; insert garment ticket in bag	Hand			2	1,400
23. Close side seams from top to bottom	Union Special 43-200F	7	L	9	250
24. Make belt loops for waistband	Blind Stitch 68BL	1	U	2	1,200
25. Sew on waistband, including 6 or 7 belt loops	Singer 31-15		L	8	225

Footnotes at end of table.

Plant C - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
26. Press open seam at pocket mouth, turn over & press down lip of pocket, press waistband seam, press over right fly seam, press back left fly	New York Press 23-311 Hoffman 466977 (8)	1)		8	250
	Jasper Sunshine	25		2	1,800
27. Bar-tack loops on waistband, side pockets, hip pockets (27, 43)	Singer 31-15	25	U	14	160
28. Sew round side pocket; close pocket to stay	Singer 96-10	15	L	5	400
29. Serge left fly	Wilcox & Gibbs (Super Lock DF)	8	L	1	1,800
30. Make watch pocket	Singer 96-45	13	L	1	1,600
31. Sew on watch pocket to top of waistband	Singer 96-10	15	L	1	400
32. Put in snaps on waistband	Gripper Machine Scovill 241B-2 Scovill 268B-2	3	U	2	1,800
33. Corner left & right flies	Singer 96-40 (See 36)	15	L	4	400
34. Fell on waistband lining	Union Special 9900-AT	8	L	4	500
35. Sew side of watch pocket to waistband lining	Singer 12W-208	20	L	3	750
36. Sew on edge of right fly to waistband lining	Includes second part of operation 33 Singer 96-10	15		3	600
37. Press waistband lining & press seam of right fly lining (37, 39)	Jasper Sunshine	30		4	500
38. Stitch left fly	Singer 96-10	15	L	3	600
39. Check waist measure	(See 37)				

Footnotes at end of table.

Plant C - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment			Number of workers	Worker's output per 8-hr. day 2/
	Name and model number	Average age	Drive 1/		
40. Sew back seam, beginning three inches from crotch & make vent (40, 45)	Union Special 51300	8	L	3	500
41. Sew on six suspender buttons, inserting button stay to each	Singer 114-35	4	L	3	800
42. Stitch down waistband lining & close right fly edge	Singer 96-41	10	L	7	250
43. Bar tack loops through waistband	(See 27)				
44. Close in-leg seams	Union Special 43-200-F	7	L	5	400
45. Close crotch seam	(See 40)				
46. Put on zip runner	Talon-Clamp	10		2	1,500
47. Tape crotch	Singer 96-10	15	U	3	700
48. Bar-tack crotch	Singer 68-10	10	U	2	1,400
49. Press back seams	Jasper-Sunshine	25		2	900
50. Clean, sew on tickets & remove Soabar tickets 3/	Trim-Master	1	U	8	250
51. Press legs	Hoffman			6	400
52. Press round top	Hoffman	25-30		7	370
53. Pink bottoms	Chandler Pinking Machine	15	U	1	2,400
54. Examine & clean stains	Hand			9	225

1/ L - line drive, U - unit drive.

2/ Output shows the performance of the reporting establishment and does not represent the rated capacity of the machinery or equipment.

3/ This firm performs three operations at this point: (1) "clean and remove Soabar tickets," data refer to this operation; (2) "sew on tickets by machine", three machines, Singer S114-31, 1 year of age, unit drive, one operator, 1,200 pants per worker-day; (3) "trim belt loops and open watch pocket," hand operation, four operators, 500 pants per worker-day.

Table 15. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the making department of nine selected plants, U.S.A., 1950

Plant D* - Men's Winter Suits

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
FOREPARTS			
1. Pipe seams. (1,14)	Singer 96-40	5	300-350
2. Sew darts.	Singer 96-40	7	250
3. Tape front armhole fore and shoulder.	Singer 96-40 (Done after 12)	5	350
4. Press darts.	Hoffman Jumper Press	4	400-450
POCKETS			
5. Make welt.	Singer 96-40	3	500-600
6. Mark welt.	Done by Pocket Marker		
7. Sew on welt.) 8. Piece pocket.)	Singer 96-40	17	100
9. Sew on welts.	Not done		
10. Cut mouth.	(See 7 and 8)		
11. Finish and tack pocket welt.	Singer 96-10	17	100
12. Baste pocket mouth.	Singer 55-5	2	800
13. Press pockets.	Hoffman	3	550
BACKS			
14. Pipe seams.	(See 1)		
15. Close back seam.	Singer 96-40	3	550
16. Make back and pocket lining. (16,33-37)	Singer 96-40	17	100
17. Press lining. (17,38)		4	425-450
18. Baste canvas. (18,26,27)	Singer Jumper #12	10	150-175
19. Pair in back and fore.	Hand	1	1,600-1,700
20. Close side seams.	Singer 96-40	4	550
21. Tape back armhole.	Singer 96-40	3	550
22. Press side back and armholes.	Jumper	3	550
FRONTS			
23. Press canvas.	Buy all pressed		

*Plant D - This plant employs over 1,000 workers. It is an inside shop using the progressive bundle system of production, and manufactures grade 3 suits. The plant comprises sponging, cutting and making departments. Worker's output is based on actual time. All machines are on group drive and are an average age of 15 years. Production is planned to make 1,600 suits per day.

Plant D - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
24. Pair in canvas.	Hand	1	1,600-1,700
25. Mark break.	Not done		
26. Canvas foreparts.	(See 18)		
27. Baste on bridle	(See 18)		
28. Pad lapels and bridle.	American Blindstitch	8	200
29. Press fronts.	Hoffman	2	1,000
30. Shape.	Hand	11	150
31. Cut round canvas.	Hand	2	800
32. Pipe bottoms.	Singer 96-10	2	800
LINING			
33. Piece up lining.)			
34. Piece lining pocket.)			
35. Make lining pocket.)	(See 16)		
36. Sew round lining pocket.)			
37. Stitch stay.)			
38. Press lining.	(See 17)		
39. Pair in lining with coat.	Hand	1	1,600
40. Baste under.	Singer Jumper	6	275
41. Sew round.	Singer 96-41	8	200
42. Fasten tapes.	American Blindstitch	2	800
43. Press tapes.	Hoffman	2	800
44. Press edge seam open.	Jumper	4	400
45. Trim facings and turn out.	Hand	4	400
46. Baste edges and bottom.	Singer 410W-100	8	200
47. Bluff edges.	Lewis Model 17	3	550
48. Fasten bottoms.	Lewis Model 17	2	800
49. Flat baste facing.	Singer Jumper	6	250
50. Baste lining.	Singer Jumper	8	200
51. Fasten facings.	Lewis Model 17	3	550
52. Set edges.	Hoffman	2	800
53. Fell lining side seams and bottoms.	Lewis Model 30	5	350
54. Trim canvas at armhole, shoulder and gorge.	Hand	2	800
55. Close shoulders.	Singer 96-10	4	400-450
56. Press open shoulders.	Jumper	3	550
57. Mark neck inlay.	Hand	2	800

Plant D - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
58. Seam under-collar and canvas.	Singer 96-10	2	800
59. Press seam.	Not done		
60. Pad under-collar.	American Blindstitch	2	800
TOP-COLLAR			
61. Press and stretch top-collar.	Gas Iron	2	800
62. Shape top-collar.	Not done		
63. Pair in top-and under-collar with coat.	Hand	1	1,600-1,700
64. Baste on under-collar	Singer 24-33	2	1,400
65. Press in under-collar	Hoffman	1	1,600-1,700
66. Shape under-collar.	Hand	3	550
67. Fasten bridles and baste.	Not done		
68. Draw breaks.	Not done		
69. Fell under-collar.)	Singer 96-10	2	800
70. Fell collar edge.)			
SLEEVE			
71. Close front seam.	Singer 96-10	4	400
72. Press forearm seam.	Jumper	2	800
73. Tack cuff canvas.	American Blindstitch	1	1,600-1,700
74. Mark and sew vent.	Singer 96-10	6	250-275
75. Baste bottom of sleeve.	Singer 24-33	1	1,600-1,700
76. Press cuff.	Not done		
77. Sew elbow seam and tack vent.	Singer 96-10	5	300-350
78. Press elbow seam.	Jumper	2	800
79. Close sleeve lining seams.	Singer 96-10	5	350
80. Pair in sleeve lining.	Hand	1	1,600-1,700
81. Tack sleeve lining to sleeve seams.	Singer 96-10	4	400
82. Fell bottoms of sleeves.	Lewis Cylinder 16-17	4	400
83. Turn and press sleeve.	Hand	2	600
84. Pair in sleeves.	Hand	1	1,600-1,700
85. Sew in sleeves.	Singer 96-10	16	100
86. Press armhole.	Jumper	10	150
87. Baste armhole and insert pad.	Singer Jumper	10	150

Plant D - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
88. Felling	Hand	130	30-40
89. Mark and cut buttonholes.	Hand	2	800
90. Make buttonholes.	Reece Button Hole	4	400
91. Pull bastings.	Hand	17	100
92. Press edges.	Hoffman	5	350
93. Press collars and shapes.	Hoffman	10	140
94. Remove impressions of collar and shapes (94,97).	Hoffman	8	200
95. Press fronts.	Hoffman	9	175
96. Mark and sew buttons.	Hand	3	550
97. Press elbows.	(See 94)		
98. Press sleeves.)	Hoffman	14	120
99. Press side seams.)			
100. Press backs.)			
101. Press shoulders and armholes.	Hoffman	24	68
102. Touch up with Hand Iron.	Hand	11	144
103. Roll lapels.	Hoffman	3	550

Plant D - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
FRONTS			
1. Serge in and out leg seams and fork run, taking in fork stay.	Merrow A3-Dwl	3	650
2. Sew in pleats.	Singer 24-33	2	800
3. Press pleats.	Not done		
4. Sew on pocket facing, turning in; (Bottom of facing shaped).	Singer 96-10	5	400
5. Sew pockets and facing to front; nick seam at both ends of stitching.	Not done		

Plant D - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
6. Turn back, pipe, turn in and sew down inside edge of pocket facing.	Not done		
7. Sew pocket, tack mouth top and bottom nick facing of pocket below bottom; tack and pair off surplus facing at top.	Not done		
8. Sew zip to left fly on twin needle taking in lining; sew right fly to zip.	Singer 96-10	2	1,000
9. Trim zip level with top of fly; sew jean stay to left fly top.	Not done		
10. Sew fly lining to right fly.	Singer 96-10	1	2,000
11. Nick front for fly; sew left fly to front.	Not done		
BACKS			
12. Serge in and cut leg seams, taking in pocket stay on side seam; serge seat seam.	Merrow A3DW1	3	650
13. Sew darts.	Singer 96-10	3	650
14. Press darts.	Jumper	2	1,000
15. Mark hip pockets.	Hand	2	1,000
16. Lay pocket, back and facing with drilled holes in pocketing in line with hip pocket mark; sew across on twin needle m/c with knife between needles cutting as sewing.	Not done		
17. Make bottom welt; turn in facing and sew down in pocket.	Singer 96-10		100

Plant D - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
18. Sew each side of pocket, using knife trimmer.	Not done		
19. Turn out hip pocket; catch ends; insert tab on left hip only; loop for button.	Not done		
20. Mark and sew button to hip pocket (L).	Not done		
21. Sew round hip pocket.	Singer 96-10	3	650
22. Pair in backs and fronts, insert garment ticket, in hip pocket.	Hand	1	2,000
23. Close side seams from top to bottom (23,31)	Singer 96-10	7	300
24. Make belt loops for waist band.	Singer Looper	2	1,000
25. Sew on waistband, including 6 or 7 belt loops.	Singer 96-10	6	350
26. Press open seam at pocket mouth, turn over and press down lip of pocket, press over right fly seam, press back left fly.	Jumper	4	500
27. Bar-tack loops on waistband, side pockets, hip pockets. (27,43).	Singer 68	7	300
28. Sew round side pocket; close pocket to stay.	Singer 96-10	4	500
29. Serge left fly.	Merrow A3DW1	1	2,000
30. Make watch pocket by serging machine.	Merrow ABDW1	1	2,000
31. Sew on watch pocket to top of waistband	(See 23)		
32. Make top buttonhole.	Reece Button Hole	1	2,000

Plant D - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
33. Sew on top button.	Singer 175S V-12	1	2,000
34. Fell on waistband lining.	Not done		
35. Sew side of waistband lining.	Not done		
36. Sew on edge of right fly to waistband lining.	Singer 96-10	1	2,000
37. Press waistband lining and press seam of right fly lining.	Jumper	3	650
38. Stitch left fly.	(See 42)		
39. Check waist measure.	Hand	1	2,000
40. Sew back seam, beginning 3 in. from crotch and make vent.	Singer 96-10	3	650
41. Sew on 6 suspender buttons, inserting button stay to each.	Singer 175S V-12	2	1,000
42. Stitch down waistband lining and close right fly edge (42,38).	Singer 96	7	300
43. Bar-tack loops thru waistband.	(See 27)		
44. Close in leg seams.	Singer 96-10	4	500
45. Close crotch seam.	Not done		
46. Put on zip runner and staple end of zip.	Singer 96-10	2	1,000
47. Tape crotch.	Not done		
48. Bar-tack fly.	Singer 51-10	1	2,000
49. Press side seam, in-leg seams, and back seams.	Jumper	4	500
50. Clean, sew on tickets and remove Soabar tickets.	Hand	16	125
51. Press legs.	Hoffman	5	400
52. Press round top.	Hoffman	5	400
53. Pink bottoms.	Northampton Pinker	1	2,000
54. Examine and clean stains.	Hand	5	400

Table 15. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the making department of nine selected plants, U.S.A., 1950

Plant E* - Men's Winter Suits

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
FOREPARTS			
1. Book seams. 1/	American Blindstitch (Backs and fronts)	1	250
2. Sew darts. 3. Tape front armhole fore and shoulder.	Singer 241-12	2	135
4. Press darts.	New York Press	1	450
POCKETS			
5. Make welt (5,8).	Singer 241-12	2	135
6. Mark welt.	Hand	1	1,200
7. Sew on welt.	Singer 241-12	2	135
8. Piece pocket.	(See 5)		
9. Sew on welts. 10. Cut mouth and press open.	Singer 241-12	4	65
11. Finish pockets.	Hand	1	250
12. Baste pocket mouth.	Singer 410W110	1	250
13. Press pockets.	New York Press	1	450
BACKS			
14. Pipe seams.	Not done		
15. Close back seam.	Singer 241-12	1	250
16. Make lining.	Not done		
17. Press lining.	Not done		
18. Baste.	Not done		
19. Pair in back and fore parts.	Hand	1	500
20. Close side seams.	Singer 241-12	1	250
21. Tape back armhole.	Singer 241-12	1	300
22. Press side back and armholes.	New York Press	1	400
FRONTS			
23. Press canvas.	Hoffman	1	600

*Plant E - This plant employs between 250 and 300 workers. It is an inside shop using the bundle system of production, and manufactures grade 4 suits, sport coats and slacks. The plant comprises cutting, making and shipping departments; sponging operations are contracted. Worker's output is based on actual time. Unit drive machines are used throughout the sack coat shop, and line drive throughout the pants shop, with average age of machines 7 years and 15 years respectively. Production is planned to make 250-300 suits per day.

Footnote at end of table.

Plant E - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
24. Pair in canvas.)	Hand	1	250
25. Mark break.)			
26. Canvas foreparts.)			
27. Baste on bridle.	Singer 12W208	1	250
28. Pad lapels and bridle.	American Blindstitch Model Dearborn #9	1	150
29. Press fronts.	Hoffman	1	400
30. Shape.)	Hand	2	135
31. Cut round canvas.)			
32. Book bottoms (32 and 48).	American Blindstitch and Lewis 43-24	1	250
LINING			
33. Piece up lining.)			
34. Piece lining pocket.)			
35. Make lining pocket.)			
36. Sew round lining pocket.)			
37. Stitch stay.)			
38. Press lining.	Hoffman	1	300
39. Pair in lining with coat.	Hand	1	400
40. Baste under.	Singer 12W208	1	250
41. Sew round.	Singer 96-45	2	135
42. Fasten tapes.	Lewis 43-24	1	250
43. Press tapes.	Hoffman	1	500
44. Press edge seam open.	New York Press	1	50
45. Trim facings and turn out.	Hand	1	250
46. Baste.	Singer 410W100	1	250
47. Bluff edges.	Lewis 24-12	1	250
48. Fasten bottoms.	(See 32)		
49. Flat baste facing.	Singer 12W208	1	250
50. Baste lining.	Singer 12W208	1	250
51. Fasten facings.	American Blindstitch Model Dearborn	1	250
52. Set edges.	Not done		
53. Fell lining side seams and bottoms.	Lewis 30-23 30-21	1 1	125 125
54. Trim canvas at armhole shoulder and gorge.	Hand	1	250

Plant E - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
55. Close shoulders.	Singer 241-12	2	135
56. Press open shoulder.	New York Press	1	600
57. Mark neck inlay.	Hand	1	350
58. Seam under-collar and canvas (58,60).	Singer 241-12 Lewis 24	1	250
59. Press seam.	New York Press	1	600
60. Pad under-collar.	(See 58)		
TOP-COLLAR			
61. Press and stretch top-collar.	New York Press	1	250
62. Shape top-collar (62,66).)	Hand	1	250
63. Pair in top-and under-collar with coat.)			
64. Baste on under-collar.	Hand	2	125
65. Press in under-collar.	Not done		
66. Shape under-collar.	(See 62)		
67. Fasten bridles and baste.	Hand	1	250
68. Draw breaks.	Not done		
69. Fell under-collar.	Hand	3	85
70. Fell collar edge.	Hand	2	125
SLEEVE			
71. Close forearm seam.	Singer 241-12	1	250
72. Press forearm seam.	New York Press	1	600
73. Tack cuff canvas.)	Singer 241-12	2	175
74. Mark and sew vent.)			
75. Baste cuff.	Hand	1	250
76. Press cuff.	New York Press	1	500
77. Sew hindarm seam.	Singer 241-12	1	250
78. Press hindarm seam.	New York Press	1	500
SLEEVE LINING			
79. Close sleeve lining seams.	Singer 241-1	1	500
80. Pair in sleeve lining.)	Singer 245-3	1	250
81. Tack sleeve lining to cuff.)			
82. Baste sleeve lining to cuff.	Hand	1	250

Plant E - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
83. Turn and press) sleeve.) 84. Pair in sleeves.)	Hand	1	250
85. Sew in sleeves.	Singer 245-3	4	65
86. Press armhole.	New York Press	2	165
87. Baste armhole and	Hand	4	65
insert pad.	Hand	2	125
88. Felling.	Hand	16	16
89. Mark and cut buttonholes	Reece Buttonhole	1	600
90. Make buttonholes.	Hand	10	25
91. Pull bastings.	Hand	4	65
92. Press edges.	Hoffman	1	250
93. Press collars and) shapes.) 94. Remove impressions) of collar and) shapes.)	Hoffman	1	250
95. Press fronts.	Hoffman	1	250
96. Mark and sew buttons.	Hand	5	50
97. Press elbows.) 98. Press sleeves.) (97,98,102))	Hand	6	45
99. Press side seams.) 100. Press backs.)	Hoffman	1	250
101. Press shoulder and armholes.	Hoffman	1	250
102. Touch up with Hand Iron.	(See 97,98)		
103. Roll lapels.	Hoffman	1	250

1/ Cloth is turned under at seams. Each sack coat requires approximately one inch more of cloth as a result.

Plant E - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
FRONTS			
1. Serge in and out leg seams and fork run, taking in fork stay (1 and 12).	Merrow	1	300
2. Sew in pleats.	Singer 96-10	1	300
3. Press pleats and darts (3,14,26).	New York Press	1	300
4. Sew on pocket facing, turning in; (bottom of facing shaped).	Singer 96-10	1	300
5. Sew pockets and facing to front; nick seam at both ends of stitching.	Singer 96-10	4	80
6. Turn back, pipe, turn in and sew down inside edge of pocket facing. (6,17,19, 21,22)	Singer 96-10	3	100
7. Sew pocket, tack mouth top and bottom, nick facing of pocket below bottom; tack and pair off surplus facing at top.	(See 5)		
8. Sew zip to left fly on twin needle taking in lining; sew right fly to zip.)	Singer 96-10 (No twin needle used)	2	200
9. Trim zip level with top of fly; sew jean stay to left fly top.)			
10. Sew fly lining to right fly.)	Singer 96-10	1	300
11. Nick front for fly; sew left fly to front.)			
BACKS			
12. Serge in and out leg seams, taking in pocket stay on side seam; serge seat seam.	(See 1)		

Plant E - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
13. Sew darts.	Singer 96-10	1	500
14. Press darts.	(See 3)		
15. Mark hip pockets 16. Lay pocket, back and facing with drilled holes in pocketing in line with hip pocket mark; sew across on twin needle m/c with knife between needles cutting as sewing.	112W127	1	300
17. Make bottom welt; turn in facing and sew down in pocket.	(See 6)		
18. Sew each side of pocket, using knife trimmer.	Not done		
19. Turn out hip pocket; catch ends; insert tab on left hip only; loop for button.	(See 6)		
20. Mark and sew buttons to hip pocket (L) and suspender buttons. (20,41)	Union Special 175-5	1	600
21. Sew round hip pocket.	(See 6)		
22. Pair in backs and fronts insert garment ticket, in hip pocket.	(See 6)		
23. Close side seams from top to bottom.	Singer 96-10	1	300
24. Make belt loops for waistband and serge left fly. (24,29)	Merrow Serges American Blindstitch Model #9	1	300
25. Sew on waistband, including 6 or 7 belt loops.	Singer 96-10	1	300

Plant E - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
26. Press waistband seam.	New York Press	1	1,000
Press open seam at pocket mouth, turn over and press down lip of pocket, press over right fly seam, press back left fly.	(See 3)		
27. Bar-tack loops on waistband, side pockets, hip pockets.	Singer 68-32	1	300
28. Sew round side pocket; close pocket to stay.	Singer 96-10	1	500
29. Serge left fly.	(See 24)		
30. Make watch pocket by serging machine. 31. Sew on watch pocket to top of waistband.	(See 5)		
32. Put in snaps on waistband.	Not done		
33. Corner left and right flys. (33, 36)	Singer 96-10	1	300
34. Sew on waistband lining and tape crotch. (34,47)	Union Special	1	300
35. Sew side of watch pocket to waistband lining.	Not done		
36. Sew on edge of right fly to waistband lining.	(See 33)		
37. Press waistband lining and press seam of right fly lining.	New York Press	1	500
38, Stitch left fly.	Not done		
39. Check waist measure 40. Sew back seam, beginning 3 in. from crotch and make vent.	Singer 96-10	2	150

Plant E - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
41. Sew on 6 suspender buttons, inserting buttons stay to each.	(See 20)		
42. Stitch down waistband lining and close right fly edge.	Singer 96-10	1	300
43. Bar tack loops thru waistband. (43,46)	Reece Buttonhole Singer 68-32 and buttonhole	1	300
44. Close in-leg seams.)	Union Special 51300G	1	300
45. Close crotch seam.)			
46. Put on zip runner and staple end of zip.	(See 43)		
47. Tape crotch.	(See 34)		
48. Bar tack fly.	Singer 68-32	1	300
49. Press side seam, in-leg seams, and back seams.	New York Press	1	500
50. Clean, sew on tickets and remove Soabar tickets.	Hand	2	150
51. Press legs.	Hoffman	1/ 1	250
52. Press round top.	Hoffman	1/ 1	225
53. Pink bottoms.	Not done		
54. Examine and clean stains.	Hand	1	300

1/ One relief man helps on operations 51 and 52.

Table 15. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the making department of nine selected plants, U.S.A., 1950

Plant F* - Men's Winter Suits

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age	Drive 1/		
FOREPARTS					
1. Pipe front and back seams. (1, 14)	Singer 241-12	3	L	1	300
2. Sew darts.	Singer 96-87		L	2	200
3. Tape front armhole fore and shoulder.	Singer 245-1	3	L	1	300
4. Press darts.	Hoffman	10	U	1	400
POCKETS					
5. Make welt.	Singer 245-1	3	L	1	600
6. Mark welt.	Hand (Metal Template)			1	600
7. Sew on welt.	Singer 96-80 (Breast Pocket)	10	L	1	250
8. Piece pocket.	Singer 96-10	15	L	1	400
9. Sew on welts.	Singer 96-80 (Side Pockets)	10	L	1	250
10. Cut mouth.)	Hand				
Press open.)	Not done				
11. Finish pockets.)	Singer 96-10	10	L	1	260
12. Baste pocket mouth.	Singer 410W101	5	L	1	300
13. Press pockets.	Hoffman TP2	5	U	1	400
BACKS					
14. Pipe seams.	(See 1)				
15. Close back seam.	Singer 241-12	3	L	1	600
16. Make lining.	Not done				
17. Press lining.	Not done				
18. Baste.	Not done				
19. Pair in back and fore parts.	Hand			1	400

*Plant F - This plant employs between 500 and 600 workers. It is an inside shop using the bundle system of production and manufactures grade 2± men's suits, topcoats, sport jackets and slacks. The plant comprises cutting, making, and shipping and receiving departments; sponging and shrinking are contracted. Workers' output is based on actual time. Drives used in the sack coat shop are indicated in the table; unit drive is used exclusively in the pants shop. Production is planned to make 300 to 400 suits per day.

Footnotes at end of table.

Plant F - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age	Drive 1/		
20. Close side seams.	Singer 245-2	3	L	1	400
21. Tape back armhole.	Union Special 90292	5	L	1	400
22. Press side back and armholes.	Hoffman LV-14	5	U	1	400
FRONTS					
23. Press canvas.	Not done				
24. Pair in canvas.	Hand			1	600
25. Mark break.	Singer 12W206 (2 workers do all 3 operations)	15	U	2	175
26. Canvas foreparts.					
27. Baste on bridle.					
28. Pad lapels and bridle.	Dearborn Blindstitch Model #9	10	L	1	400
29. Press right and left fronts.	Hoffman VT34-L	10	U	1	500
30. Shape.	Hand			1	300
31. Cut round Canvas.	Hand			1	500
32. Pipe bottoms.	Singer 245-2	5	L	1	500
LINING					
33. Piece up lining.	Singer 245-1 (2 workers do both operations)	5	L	2	200
34. Piece lining pocket.					
35. Make lining pocket.	Singer 241-12 (3 workers do all 3 operations)	5	L	3	100
36. Sew round lining pocket.					
37. Stitch stay.					
38. Press lining.	New York Press U-1	10	U	1	400
39. Pair in lining with coat.	Hand			1	500
40. Baste under.	Hand			2	150
41. Sew round.	Singer 245-4	5	L	1	250
42. Fasten tapes.	Blindstitch B88	10	L	1	500
43. Press tapes.	Not done				
44. Press edge seam open.	Hoffman LJ-14	10	U	1	500
45. Trim facings and turn out.	Hand			1	300

Footnotes at end of table.

Plant F - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age	Drive 1/		
46. Baste.	American Blindstitch EWB1	10	L	1	300
47. Bluff edges.	Lewis Lockstitch 24-12	1	L	1	300
48. Fasten bottoms.	Lewis Lockstitch 72SX2	10	L	1	500
49. Flat baste facing.	Singer 12W206	10	U	1	300
50. Baste lining. (50,54)	Hand			3	100
51. Fasten facings.	Dearborn 938	10	L	1	400
52. Set edges.	Not done				
53. Fell lining side seams and bottoms.	Lewis Lockstitch 30-22	10	L	1	300
54. Trim canvas at armhole, shoulder and gorge.	(See 50)				
55. Close shoulders.	Singer 245-1	5	L	1	400
56. Press open shoulders.	New York Press G4	20	U	1	700
57. Mark neck inlay.	(See 64)				
58. Seam under-collar and canvas.	Singer 96-80	15	L	1	600
59. Press seam.	Hoffman LCF7	10	U	1	1,000
60. Pad under-collar.	Dearborn Blindstitch Model #9	10	L	1	700
TOP-COLLAR					
61. Press and stretch top-collar.	Not done 2/				
62. Shape top-collar.	Not done				
63. Pair in top- and under-collar with coat.	Hand			1	1,000
64. Baste on under-collar (64,57)	Hand			4	95
65. Press in under-collar.	Not done				
66. Shape under-collar.	Not done				
67. Fasten bridles and baste.	Not done				

Footnotes at end of table.

Plant F - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age	Drive 1/		
68. Draw breaks.	Not done				
69. Fell under-collar.	(See 88)				
70. Fell collar edge.	Singer 107W12	10	L	1	300
SLEEVE					
71. Close forearm seam.	Singer 96-80	15	L	1	500
72. Press forearm seam.	Hoffman LCF7	10	U	1	500
73. Tack cuff canvas.)	Singer 241-12	5	L	1	300
74. Sew vent.)					
75. Baste cuff.	Not done				
76. Press cuff.	New York Press U-1	10	U	1	500
77. Sew hindarm seam.	Singer 241-12	5	L	1	300
78. Press hindarm seam.	New York Press T-2	10	U	1	500
SLEEVE LINING					
79. Close sleeve lining seams.	Singer 96-87	15	L	1	400
80. Pair in sleeve lining.	Not done				
81. Tack sleeve lining to sleeve seam.	Singer 96-87	15	L	1	300
82. Baste sleeve lining to cuff.)	Hand			1	300
83. Turn sleeve.)					
84. Pair in sleeves.	Hand			1	500
85. Sew in sleeves.	Singer 96-87 Singer 241-12	10 5	L	2	135
86. Press armhole.	Hoffman LG-16 New York Press	10 10	U	2	200
87. Baste armhole and insert pad.	Hand			5	90
88. Felling (88,69)	Hand			15	20
89. Mark and cut buttonholes.)	Mark by hand, cut by Reece Machine.				
90. Make buttonholes.)	Reece buttonhole Machine	10	U	1	300

Footnotes at end of table.

Plant F - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment			Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age	Drive 1/		
91. Pull bastings.	Hand			3	110
92. Press edges.	Hoffman TD9	3	U	1	300
93. Press collars and shapes.	Hoffman TK26	1	U	1	300
94. Remove impressions of collar and shapes.	Hoffman TK26	1	U	1	300
95. Press fronts.	Hoffman VO33R	5	U	1	300
96. Mark and sew buttons.	Hand			4	80
97. Press elbows.	Hoffman MXJ25	5	U	1	300
98. Press sleeves.)	Hoffman MXJ26, MXU27	5	U	2	150
99. Press side seams.)					
100. Press backs.)					
101. Press shoulders and armholes.	Hoffman VG5SM			3	130
102. Touch up with Hand Iron.	Koenig Gas Hand Iron			3	100
103. Roll lapels and collar.	Hoffman MXU27	5	U	1	300

1/ L - line drive, U - unit drive.

2/ "Open" collar not made. Company makes a "Sandwich" collar, i.e. top-and under-collar made as one piece.

Plant F - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
FRONTS				
1. Serge in and out leg seams and fork run, taking in fork stay. (1,12)	Merrow A-2F	3	1	300
2. Sew in pleats.	S241-12	5	1	500
3. Press pleats.	Not done			

Plant F - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
4. Sew on pockets facing, turning in; (bottom of facing shaped).	Singer 241-3	1-1/2	1	900
5. Sew pockets and facing to front; nick seam at both ends of stitching.	Singer 241-12	1	1	400
6. Turn back, pipe, turn in and sew down inside edge of pocket facing.(6,17,19)	Singer 96-107	10	3	90
7. Sew pocket, tack mouth top and bottom, nick facing of pocket below bottom; tack and pair off surplus facing at top.	Singer 241-13	1	1	300
8. Sew zip to left fly on twin needle taking in lining; sew right fly to zip. (8,9))	Singer 112W140 Twin needle	10)	1	700
9. Trim zip level with top of fly; sew jean stay to left fly top.)	Singer 241-12	2)		
10. Sew fly lining to right fly.(10,11))				
11. Nick front for fly; sew left fly to front.)	Singer 241-13	1-1/2	1	450
BACKS				
12. Serge in and out leg seams, taking in crotch lining on side seam; serge seat seam.	(See 1)			
13. Sew darts.	Singer 241-12	2	1	600
14. Press darts.	Koenig Gas Iron)	na	1	700
15. Mark hip pockets.	Hand)			

na Not available.

Plant F - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
16. Lay pocket, back and facing with drilled holes in pocketing in line with hip pocket mark; sew across on twin needle m/c with knife between needles cutting as sewing.	Not done			
17. Make bottom welt; turn in facing and sew down in pocket.	(See 6)			
18. Sew each side of pocket, using knife trimmer.	Not done			
19. Turn out hip pocket; catch ends.	(See 6)			
20. Mark and sew button to hip pocket (L).	Singer 75-391	10	1	1,200
21. Sew round hip pocket.	Singer 241-13	1-1/2	1	900
22. Pair in backs and fronts, insert garment ticket, in hip pocket.)	Union Special 51300G	2	1	500
23. Close side seams from top to bottom.)				
24. Make belt loops for waistband	Blindstitch 88BL	1	1	800
25. Sew on belt loops to trouser top.	Singer 241-13 (Hollywood style trouser)	1-1/2	1	500
26. Press open seam at pocket mouth, turn over and press down lip of pocket, press waistband seam, press over right fly seam, press back left fly.	Hoffman Jumper LCF-16	5	1	600

Plant F - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
27. Bar-tack side pockets, hip pockets, fly, watch-pocket. (27,48)	Singer 69-8	1-1/2	1	400
28. Sew round side pocket; close pocket to stay.	Singer 241-13	1-1/2	1	650
29. Serge left fly.	Singer -63	15	1	1,600
30. Make watchpocket by Serging Machine	Not done			
31. Sew on watchpocket to top of trouser.	Singer 241-13	1-1/2	1	900
32. Put in snaps on waistband.	Not done			
33. Corner left and right flys.	Singer 241-13	1-1/2)		
34. Fell on waistband lining.	Union Special 386975	) 5)	1	350
35. Sew side of watch-pocket to waistband lining.	Not done			
36. Sew on edge of right fly to waistband lining.	Not done			
37. Press waistband lining and press seam of right fly lining.	Hoffman LCF-16	5	1	600
38. Stitch left fly.)				
39. Check waist measure.)	Hand			
40. Sew back seam, beginning 3 in. from crotch and make vent.)	Singer 241-13	2	1	300
41. Sew on 6 suspender buttons, inserting button stay to each.	Singer 75-39	2	1	900
42. Stitch down waistband lining and close right fly edge.	Lewis Lockstitch 16-41	1-1/2	1	350
43. Bar-tack loops thru waistband.	Singer 68-39	1-1/2	1	500

Plant F - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
44. Close in-leg seams.) 45. Close crotch seam.)	Union Special 51300G	1-1/2	1	500
46. Put on zip runner and staple end of zip.	Talon Zip Staple 700-600	4	1	800
47. Tape crotch.	Singer 96-10	10	1	800
48. Bar-tack fly.	(See 27)			
49. Press side seams, in-leg seams, and back seams.	Zacharias Steam Press	5	1	700
50. Clean and remove Soabar tickets.	Hand		2	175
Sew on tickets.	Hand		1	600
51. Press legs.	Hoffman VE4	6	1	400
52. Press round top.	Hoffman VB10	6	1	350
53. Pink bottoms.	Chandler X521	5	1	850
54. Examine and clean stains.	Hand		1	800

Table 15. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the making department of nine selected plants, U.S.A., 1950

Plant G.* - Men's Winter Suits

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
FOREPARTS			
1. Pipe seams	Singer 241-2	1	880
2. Sew darts	Singer 96-40	5	330
3. Tape front armhole fore and shoulder	Singer 96-40	3	560
4. Press darts	New York Press K5V	4	380
POCKETS			
5. Make welt	Singer 96-40	3	455
6. Mark welt	Hand	2	1,100
7. Sew on welt	Singer 31-15	7	168
8. Piece pocket	Singer 96-80	2	455
9. Sew on welts	Singer 31-15	16	84
10. Cut mouth	Not done		
Press open	Hoffman LCF7	1	580
11. Sew around pockets	Singer 96-85		
Finish pockets	Singer 96-45	1-1/2	455
12. Baste pocket mouth	Singer 24-33	1	625
13. Press pockets	Hoffman TP2	1	970
BACKS			
14. Pipe seams	Singer 241-2	2	440
15. Close back seam	Singer 41-12 (striped material)	1	695
16. Make lining	(See 33)		
17. Press lining	(See 38)		
18. Baste	(See 50)		
19. Pair in back and fore parts	Hand	1	1,817
20. Close side seams	Singer 96-40	2	495
21. Tape back armhole	Singer 96-80	2	630
22. Press side back and armholes	Jasper FGU-1	3	440

*Plant G - This plant employs over 1,000 workers. It is an inside shop using the progressive bundle system of production, and manufactures grade 4 men's suits, topcoats and other wearing apparel. The plant comprises sponging, shrinking and finishing, cutting and making departments. Worker's output is based on actual production time. Machines are on unit drive. Production is planned to make about 4,000 suits per day.

Plant G - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
FRONTS			
23. Press canvas	New York Press MCGR	1	1,755
24. Pair in canvas)	Hand	1	1,250
25. Mark break)			
26. Canvas foreparts)	Singer 512W208 Singer 212W211	6	206
27. Baste on bridle)			
28. Pad lapels and bridle	American Blind Stitch Dearborn #9	3	470
29. Press fronts	New York Press MCGR (4 machines)	2	775
30. Shape)	Hand	5	187
31. Cut round canvas)			
32. Pipe bottoms	Singer 241-2	1	1,375
LINING			
33. Piece up linings (33,16)	Singer 96-80	5	187
34. Piece lining pocket)	Singer 96-40	10	115
35. Make lining pocket)			
36. Sew round lining pocket)			
37. Stitch stay)			
38. Press lining (38,17)	Jasper F410	3	450
39. Pair in lining with coat	Hand	1	1,400
40. Baste under	Hand	8	153
41. Sew round	Singer 96-45	4	255
42. Fasten tapes	American Blind Stitch Dearborn #9A	1	670
43. Press tapes	Jasper FGU2	1-1/2	960
44. Press edge seam open	Hoffman HOO-7	1-1/2	640
45. Trim facings and turn out	Hand	3	520
46. Baste	Singer 24-33	5	325
47. Bluff edges	Lewis 24	1	500
48. Fasten bottoms	Lewis 17-13	1-1/2	780
49. Flat baste facing	Singer 12W211	3	560
50. Baste lining (50,18)	Hand	18	68
51. Fasten facings	American Blind Stitch Dearborn #9	1	865
52. Set edges	New York TD038	2	800
53. Fell lining side seams and bottoms	Lewis 30	3	370

Plant G - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
54. Trim canvas at arm-hole, shoulder and gorge	Hand	1	1,050
55. Close shoulders	Singer 96-80	3	480
56. Press open shoulders	Hoffman LG77	2	485
57. Mark neck inlay	Hand	1	1,125
58. Seam under-collar and canvas	Singer 31-15	1	1,115
59. Press seam	Hoffman LCF7	1	4,900
60. Pad under-collar	American Blind Stitch Dearborn #9	1	1,100
TOP-COLLAR			
61. Press and stretch top-collar	Hoffman TK18	2	2,750
62. Shape top-collar	Not done		
63. Pair in top- and under-collar with coat) 64. Baste on under-collar)	Hand	3	420
65. Press in under-collar	Hoffman HOC-7	1	4,550
66. Shape under-collar	Hand	2	690
67. Fasten bridles and baste	Hand	21	68
68. Draw breaks	Singer 96-40	4	430
69. Fell under-collar	(See 88)		
70. Fell collar edge	Hand	8	173
SLEEVE			
71. Close forearm seam	Singer 96-80	2	765
72. Press forearm seam	New York Press K5V	2	1,006
73. Tack cuff canvas	Singer 96-40	1	730
74. Mark and sew vent	Singer 96-40	2	730
75. Baste cuff	Singer 24-33	1	780
76. Press cuff	Hoffman 3CB20	1	2,180
77. Sew hindarm seam	Singer 96-40, 96-80	3	400
78. Press hindarm seam	Jasper FSB1	2	800
SLEEVE LINING			
79. Close sleeve lining seams	Singer 96-80	2	525
80. Pair in sleeve lining) 81. Tack sleeve lining to cuff)	Singer 96-80	2-1/2	460

Plant G - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Number of workers	Worker's output per 8-hr. day
82. Baste sleeve lining to cuff	Hand	4	330
83. Turn and press sleeve			
84. Pair in sleeves	Hand	2	1,600
85. Sew in sleeves	Singer 31-15	9	120
86. Press armhole	Jasper FRM5 New York Press G5Y	6	160
87. Baste armhole and insert pad	Hand	25	64
88. Felling (88,69)	Hand	38	35
89. Mark and cut buttonholes	Hand	1	870
90. Make buttonholes	Hand	35	32
91. Pull bastings	Hand	12	93
92. Press edges	Hoffman TDO	2	440
93. Press collars and shapes	Hoffman TK13	4	255
94. Remove impressions of collars and shapes	(See 102)		
95. Press fronts	Hoffman BO21R	2	390
96. Mark and sew buttons	Hand	11	152
97. Press elbows)	Hoffman HU4)		
98. Press sleeves)	New York NU4)	13	88
99. Press sideseams)			
100. Press backs)			
101. Press shoulders and armholes	New York BG5	12	86
102. Touch up with hand irons(102,94)	Hand Steam Iron	9	108
103. Roll lapels	Hoffman HU4	2	510

Plant G - Men's Winter Suits - Continued

Operations on vests	Name and model number of machinery	Age of machines	Number of workers	Worker's output per 8-hr. day
FOREPARTS				
1. Sew darts	Singer 96-40	15	2	640
2. Press darts and welts	Hoffman Jumper	15	1	580
3. Trim welts	Hand		2	665
4. Make welts	Singer 96-40	20	5	230
5. Sew on welts	Singer 31-15	20	7	168
6. Cut open pocket mouth	Hand		2	545
7. Press open welt seams	Not done			
8. Tack pockets	Singer 31-15	20	8	154
9. Sew round welt pockets	Singer 245-4	20	1/2	785
10. Baste canvas by machine	(See 14)			
11. Press foreparts	Hoffman	15	1	200
12. Trim canvas and shape bottom	(See 16)			
13. Mark shape, assemble lining and front	Not done			
14. Baste under by machine (14,10)	Singer 12W208	20	1	290
15. Baste armhole by hand	Not done			
16. Join neck and sew tape (16,12)	Singer 96-45	20	5	210
17. Pull bastes and turn vests	Hand		1	520
18. Stitch edges	Singer 245-2	10	3	250
19. Press shoulder pleats	Hoffman Jumper	20	1	510
20. Baste sides and shoulders	Not done			
21. Trim sides and shoulders	Not done			
22. Press front edges	Not done			
23. Join backs and fronts				
24. Join sides and shoulders	Singer 96-40	20	6	174

Plant G - Men's Winter Suits - Continued

Operations on vests	Name and model number of machinery	Age of machines	Number of workers	Worker's output per 8-hr. day
25. Fell necks	Hand		9	140
26. Remove size ticket	Not done			
27. Mark buttonholes	Hand		1	1,520
28. Make buttonholes	Reece Button Hole	15	2	690
29. Bar tack, if machine hole	Singer 68-38	20	1	1,265
30. Baste backs	Not done			
31. Stitch backs	Not done			
32. Pull bastes from backs	Not done			
33. Press-off backs (33,41)	Hoffman	20	2	480
34. Press-off fronts	Hoffman	20	5	290
35. Mark for and count buttons	Hand		1	1,575
36. Sew on buttons and tickets	Hand		12	118
37. Brush and clean	Not done			
LININGS				
38. Make linings	Singer 96-40	20	4	275
BACK				
39. Make backs (1st operation))	Singer 96-40	20	7	188
40. Make backs (2nd operation))				
41. Press backs	(See 33)			

Plant G - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Age of machines	Number of workers	Worker's output per 8-hr. day
FRONTS				
1. Serge in and out leg seams and fork run, taking in fork stay	Singer 81-65 Singer 246	12 1-1/2	6	632
2. Sew in pleats	Singer 24-33	16	6	550
3. Press pleats	(See 26)			
4. Sew on pocket facing, turning in; (bottom of facing shaped)	Singer 96-40 Singer 96-40	19 12	6	450
5. Sew pockets and facing to front; nick seam at both ends of stitching (5,31)	Singer 96-20	12	10	396

Plant G - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Age of machines	Number of workers	Worker's output per 8-hr. day
6. Turn back, pipe, turn in and sew down inside edge of pocket facing	Singer 96-80	12	4	760
7. Sew pocket, tack mouth top and bottom, nick facing of pocket below bottom; tack and pair off surplus facing at top	Singer 96-10	10	11	275
8. Sew zip to left fly on twin needle taking in lining; sew right fly to zip	Singer 112-FV16	5	5	800
9. Trim zip level with top of fly; sew jean stay to left fly top	(See 25)			
10. Sew fly lining to right fly	Singer 96-10	15	3	1,844
11. Nick front for fly; sew left fly to front	Singer 96-80	15	7	640
BACKS				
12. Serge in and cut leg seams, taking in pocket stay on side seam; serge seat seam	Singer 246-1 Singer 281-65	8	7	632
13. Sew darts	Singer 96-80	12	12	344
14. Press darts	Hand		2	910
15. Mark hip pockets	Hand		1	1,880
16. Lay pocket, back and facing with drilled holes in pocketing in line with hip pocket mark; sew across on twin needle m/c. Cut by hand	Singer 96-80	12	13	285
17. Make bottom welt; turn in facing and sew down in pocket	(See 19)			
18. Sew each side of pocket, using knife trimmer	Not done			

Plant G - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Age of machines	Number of workers	Worker's output per 8-hr day
19. Turn out hip pocket catch ends; insert tab on left hip only loop for button. (19,17)	Singer 96-80	12	18	285
20. Mark and sew button to hip pocket (L)	Hand		5	50
21. Sew round hip pocket	Singer 96-80	12	6	730
22. Pair in backs and fronts insert garment ticket in hip pocket	Hand		1	1,500
23. Close side seams from top to bottom (23,44)	Singer 96-80	12	14	235
24. Make belt loops for waistband	Union Special 52700	10	2	1,700
25. Sew on waistband, including 6 or 7 belt loops. (25,9)	Singer 96-80	12	12	256
26. Press open seam at pocket mouth, turn over and press down lip of pocket, press waistband seam, press over right fly, press back left fly (26,3)	Hoffman	15	10	1,005
27. Bar-tack loops on waistband, side pockets, hip pockets (27,40)	Singer 68-10	15	7	480
28. Sew round side pocket; close pocket to stay	Singer 96-80	12	5	548
29. Serge left fly	Merrow 3A8	6	1	2,480
30. Make watchpocket by serging machine	Merrow 3A8		1	1,600
31. Sew on watch-pocket to top of waistband	(See 5)			
32. Put in snaps on waistband				

Plant G - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Age of machines	Number of workers	Worker's output per 8-hr day
33. Corner left and right flys) 34. Fell on waistband lining) 35. Sew side of watch-pocket to waistband lining)	Singer 96-80	12	19	192
36. Sew on edge of right fly to waistband lining	Singer 96-80	12	13	600
37. Press waistband lining and press seam of right fly lining	Hoffman	10	7	380
38. Stitch left fly	Singer 111-101	12	3	720
39. Check waist measure) 40. Sew back seam, beginning 3in. from crotch and make vent. (39,40,45))	Singer 96-80	12	9	370
41. Sew on 6 suspender buttons, inserting button stay to each	Singer 114-35	12	3	1,400
42. Stitch down waistband lining and close right fly edge	Singer 111-101	12	12	270
43. Bar tack loops thru waistband	Singer 31-15	15	8	310
44. Close in-leg seams	(See 23)			
45. Close crotch seam	(See 40)			
46. Put on zip runner and staple end of zip	Scovill Gripper zipper Talon (stapling)	1-1/2	4	880
47. Tape crotch	Singer 96-80	12	5	800
48. Bar-tack fly	(See 27)			
49. Press side seam, in-leg seams, and back seams	Hoffman	15	9	365
50. Clean, sew on tickets and remove Soabar tickets	Hand		19	160
51. Press legs)	Hoffman	12	21	(324
52. Press round top)				(265
53. Pink bottoms	Chandler #9	4	1	2,500
54. Examine and clean stains	Hand		17	184

Table 15. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the making department of nine selected plants, U.S.A., 1950

Plant H* - Men's Winter Suits

Operations on sack coats	Name and model number of machinery	Worker's output per 8-hr. day
FOREPARTS		
1. Turn seams	American Blindstitch #88	280
2. Sew darts. 3. Tape front armhole fore and shoulder.	Singer 241-2	135
4. Press darts.	Hoffman half moon	250
POCKETS		
5. Make welt.	Singer 241-2	425
6. Mark welt.	Hand	1,000
7. Sew on welt and press.	Singer 241-2	106
8. Piece pocket.	Singer 241-2	260
9. Sew on welts. 10. Cut mouth and press open. 11. Finish pockets.	Singer 241-2	55
12. Baste pocket mouth.	Union Special Baster	550
13. Press pockets.	Right and Left Hoffman pocket press	500
BACKS		
14. Pipe seams.	Not done	
15. Close back seam.	Singer 241-2 (Includes sew on coupon)	480
16. Make yoke lining.	Singer 241-2	300
17. Press yoke lining.	Steam Iron on pad, Wooden Bed	750
18. Baste.	Not done	
19. Pair in back and fore parts.	Not done	
20. Close side seams.	Singer 241-2	250
21. Tape back armhole. 22. Press side back and armholes.	Hoffman Jump Press	250

*Plant H - This plant employs between 900 and 1,000 workers. It is an inside shop using a combination of production systems, and manufactures grade 5 men's suits, topcoats, slacks, sport coats and formal wear. The plant comprises cutting and making departments; 90% of the sponging operations are contracted out. Worker's output is based on actual time. Unit driven machines ranging from 3 to 9 years in age are used in the making department. Production is planned to make 500 suits per day.

Plant H - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Worker's output per 8-hr. day
FRONTS		
23. Press canvas.	Hoffman Right, Left and Stout Front Presses	600
24. Pair in canvas and trim pockets.	Shears	600
25. Mark break.	Wooden Marker	700
26. Canvas foreparts.	Singer 12W211 Jump Baster	175
27. Baste on bridle.	Union Special Baster	500
28. Pad lapels and bridle.	Lewis 59L-6	235
29. Press fronts.	2 DT-6,1 Right, 2 Left, 2 Stout	600
30. Shape.)	Shears, Shaping Sticks, Patterns	90
31. Cut round canvas.) (30,31,54))		
32. Turn bottoms.	American Blindstitch #88	600
LINING		
33. Piece up lining.	Singer 241-2	175
34. Piece lining pocket.)	Does not include yoke; one pocket, includes silk, linen, and Union Label, Singer 241-2	100
35. Make lining pocket.)		
36. Sew round lining pocket.)		
37. Stitch stay.)		
38. Press lining.	Hoffman Jump Press, Half Moon Buck	350
39. Pair in lining with coat.	Hand	700
40. First basting.	Hand	120
41. Tape sewing including gorge.	111W-152 Singer	160
42. Fasten tapes.	Lewis 43-24 Felling	265
43. Press tapes.	Hoffman DU-4	700
44. Press edge seam open.	Hoffman Jump Press, Special Long Buck	240
45. Trim facings and turn out.	Shears	230
46. Baste edge.	Union Special	200
47. Bluff edges.	Lewis felling	450
48. Baste bottoms.	Hand	
49. Flat baste facing.	Singer 12-W-111	300
50. Baste lining.	Hand	45
51. Fasten facings to canvas.	Lewis 43-24	600
52. Set edges.	Hoffman BU-4	600

Plant H - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Worker's output per 8-hr. day
53. Fell lining side seams and bottoms.	Lewis Lining Felling Machine	180
54. Trim canvas at armhole, shoulder and gorge.	(See 30)	
55. Close shoulders.	Singer 241-2	450
56. Press open shoulders.	Hoffman Jump Press, Electric Buck	350
57. Mark neck inlay and pair in collars.	na	600
58. Seam under-collar and canvas.	Singer 107-W3 Zig-Zag	425
59. Press seam.	na	1,000
60. Pad under-collar	na	350
TOP-COLLAR (Operations below replace those used by other plants) 1/		
61. Shoulder and under-collar basting.	Hand	65
62. Fell under-collar.	Hand	115
63. Stretch top-collar. Collar shape pressing.	Hoffman Jump Press, Special Half Moon Buck	220
64. Collar shaping.	Patterns and shears	350
65. Stitch around under-collar.	Singer 241-2	500
66. Baste on top-collar.	Hand	38
67. Fell gorge including neck.	Hand	60
68. Fell edge of top-collar.	Hand	125
SLEEVE		
71. Close forearm seam.	Singer 241-2	520
72. Press forearm seam.	Hoffman Jump Press	680
73. Tack cuff canvas.	Hand	
74. Mark and sew vent.	Singer 241-2	350
75. Baste cuff.	Singer Baster	560
76. Press cuff.	Hoffman Jump Press	650
77. Sew hindarm seam.	Singer 241-2	195
78. Press hindarm seam.	Hoffman Jump Press	550
79. Close sleeve lining seams.	Singer 241-2	500
80. Pair in sleeve lining.	Hand	700

Footnotes at end of table.

Plant H - Men's Winter Suits - Continued

Operations on sack coats	Name and model number of machinery	Worker's output per 8-hr. day
81. Fell sleeve bottom.	Hand	80
82. Baste sleeve lining to seams and lining.	Hand	110
83. Turn and press sleeve.	Not done	
84. Pair in sleeves.	Hand	650
85. Sew in sleeves.	Singer 241-2	65
86. Press armhole.	Hoffman Jump Press	175
87. Baste armhole.	Hand	28
Insert pad.	Hand	240
88. Felling.	Hand	16
89. Mark and cut buttonholes.	Hand	500
90. Make buttonholes.	Hand	24
91. Pull bastings.	Hand	70
92. Press edges.	Hoffman Edge Press	270
93. Press collars and shapes.)	2 Collar Shape Presses	160
94. Remove impressions of collar and shapes.)		
95. Press fronts.	Hoffman Front Press	210
96. Mark and sew buttons.	na	
97. Press elbows.	Elbow Press	320
98. Press sleeves.	Not done	
99. Press side seams.)	Hoffman Side Press	200
100. Press backs.)	Hoffman Body Press	
101. Press shoulders and armholes.	Hand Iron	24
102. Touch up with Hand Iron.	Hand Iron	150
103. Roll lapels.	Not done	

na Not available.

1/ Operations 61-68 replace operations 61-70 reported for other plants.

Plant H - Men's Winter Suits - Continued

Operations on vest	Name and model number of machinery	Worker's output per 8-hr. day
1. Trim.	Shears	175
2. Soap and press welts.	Hand	500
3. Sew welts and clam.	Singer 241-2	300
4. Baste welt.	Union Special Baster	450
5. Press welts and clams.	Hoffman Jump Press	700
6. Trim welts.	Hand	700
7. Sew on welts.	Singer 241-2	180
8. Press seam.	Hoffman	250
9. Cut open pockets.	Hand	200
10. Tack pocket.	Singer 241-2	150
11. Sew around pockets.	Singer 95-12	400
12. Baste linings.	Camfer Baster	175
13. Sew tape.	Singer 95-12	175
14. Turn edge.	Hand	375
15. Baste edge.	Edge Baster	160
16. Stitch edge.	Hand-	28
17. Stitch armhole.	Singer 241-2	600
18. Press edge.	Hoffman	450
19. Baste side and shoulder.	Singer 95-12	350
20. Backing.	Singer 241-2	170
21. Finish outside.	Hand	180
22. Finish neck.	Machine	250
23. Make buttonholes.	Hand	24
24. Pull bastings.	Hand	400
25. Off press fronts.	Hoffman	150
26. Press back.	Hoffman	130
27. Mark for buttons.	Hand	800
28. Sew on buttons.	Hand	130
29. Clean and brush.	Hand	400
30. Press lining.	Hand Iron	500
31. Press back.	Hand Iron	500
32. Make lining.	Singer 241-2	175
33. Make back.	Singer 241-2	240

Plant H - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Worker's output per 8-hr. day
1. Baste pleats.	Union Special 6500	400
2. Sew left zipper to fly.	Singer 241-2	800
3. Piecing sew up V's, sew crotch pieces.	Singer 241-2	360

Plant H - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Worker's output per 8-hr. day
4. Serge front and back part, in and out leg.	Union Special 39200QZ	400
5. Make loop.	U.S. Blindstitch 88BL	1,200
6. Facing, sew facings to pockets, sew around watch pocket.	Singer 241-2	160
7. Sew right and left fly.	Singer 241-2	360
8. Press piece, 2 V's, right and left fly pleats.	Hoffman LCF-16	400
9. Mark hip pockets.	Pattern, Wax Chalk	1,200
10. Reinforce pleats, sew stays to foreparts.	Singer 241-2	500
11. Sew pockets to back part with facing and stay and cut opening.	Singer 245-4	240
12. Make side pocket. Sew pocket to front part with facing. Turn, stitch and finish facing.	Singer 241-2	128
13. Press open welt seam hip pocket.	Hoffman LCF-16	1,200
14. Turn and stitch welts, tack corners, finish facing.	Singer 241-2	160
15. Cut pocket and fold to meet notches. Sew around side and hip pockets.	Singer 245-4	240
16. Finish and turn over hip pocket. Make, topstitch, turn over side pocket and tack top and bottom.	Singer 241-2	175
17. Pair in fronts, backs and waistbands.	None	1,200
18. Sew inside and outside seams.	Singer 241-2	100
19. Sew canvas to waistband.	Singer 241-2	1,200
20. Sew waistband to top of trouser.	Singer 241-2	175
21. Press waistband seam, and side seam at side pocket.	Hoffman LCF-16	360

Plant H - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Worker's output per 8-hr. day
22. Tack waistband for hook, make two tacks with stays.	Singer 68-39	1,000
23. Stitch pocket around side and hip pockets and side opening to back part.	Singer 241-2	240
24. Sew up left fly opening at waistband.	Singer 241-2	1,200
25. Insert hook in opening, make two tacks.	Singer 68-12	1,200
26. Sew lining to right fly, turn, make blindstitch and stitch fly. Make left corner.	Singer 241-2	240
27. 1st top press, press all pockets and waistband canvas.	Hoffman LCF-16	240
28. Press left fly and shape edge.	Hoffman XD024	700
29. Top stitch 1/16 inch below waist seam and stitch left fly.	Singer 241-2	240
30. Tack loops top and bottom.	Singer 68-39	200
31. Put on zip runner, and staple end of zip.	Waldes 211-226	800
32. Join back inseam and waistband seam.	Singer 31-15	360
33. Tack 2 side pockets, watchpocket, hook eye on fly.	Singer 68-10	360
34. Make one buttonhole in hip pocket.	Reece	800
35. Tack one buttonhole in hip pocket.	Singer 68-12	2,400
36. Press out side, inside and back seams.	Hoffman LCF-16	3,600
37. Tack one loop in back.	Singer 68-39	800
38. Finish top lining and crotch by hand.	Hand	24

Plant H - Men's Winter Suits - Continued

Operations on pants	Name and model number of machinery	Worker's output per 8-hr. day
39. Sew on suspender buttons.	Singer 68-12	640
40. Sew hip pocket button.	Hand	680
41. Insert eye in waistband.	L.M. Stein Clamp	2,400
42. Press loop.	Hoffman LCF-16	1,600
43. Notch waistband for hook opening.	Hand	1,200
44. Brush and trim all thread ends and brush off trouser trim loops.	Hand	150
45. Press around top.	Hoffman VB-10	240
46. Press legs.	Hoffman VE-4	200
47. Examine.	Hand	240

Table 15. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the making department of nine selected plants, U.S.A., 1950

Plant I[*] - Men's Winter Suits

Operations on sack coats	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
FOREPARTS				
1. Pipe seams and barbs. (1,14)	Singer 241-3	3	2	138
2. Sew darts.	Singer 96-87	10	1-1/2	183
3. Tape front armhole fore and shoulder.	Not done			
4. Press darts.	Hoffman	3-15	1-1/2	183
POCKETS				
5. Make welt.)				
6. Mark welt.)	Singer 241-3	3	2	138
7. Sew on welt.)				
8. Piece pocket.	Singer 241-3	3	1-1/2	183
9. Sew on welts.	Not done			
10. Cut mouth and press open.	Not done			
11. Finish pockets.	Singer 241-3	3	5	55
12. Baste pocket mouth.	Not done			
13. Press pockets.	Not done			
BACKS				
14. Pipe seams.	(See 1)			
15. Close back seam.	Singer 96-87	10	1-1/2	183
16. Make whole lining. (16,33,34,35,36)	Singer 96-87	10	5	55
17. Press lining.	Hoffman	3-15	1-1/2	183
18. Baste.	Not done			
19. Pair in back and foreparts.	Hand		1	275
20. Close side seams.	Singer 241-3	3	2	138
21. Tape back armhole.	Singer 96-87	10	1	275
22. Press side back and armholes.	Not done			

[*] Plant I - This plant employs between 350 and 400 workers. It is an inside shop using the bundle system of production and manufactures grade 4 men's suits, topcoats and other outer wear. The plant comprises sponging, shrinking and finishing, cutting and making departments. Worker's output is based on actual time. Machines are on group drive. Production is planned to make 275 sack coats, 120 vests and 340 pants.

Plant I - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
FRONTS				
23. Press canvas. (23,29)	Hoffman	3-15	1	275
24. Pair in canvas.	Hand		1	275
25. Mark break.	Not done			
26. Canvas foreparts.)				
27. Baste on bridle.)	Singer 12W-207	12	2	138
28. Pad lapel and bridle.	U.S. Blindstitch	15	2	138
29. Press fronts.	(See 23)		1-1/2	183
30. Shape.)	Hand			
31. Cut round canvas.)				
32. Pipe bottoms.	Singer 241-3	3	1	275
LINING				
33. Piece up lining.)				
34. Piece lining pocket.)	(See 16)			
35. Make lining pocket.)				
36. Sew round lining pocket.)				
37. Stitch stay.	Not done			
38. Press lining.	Hoffman	3-15	1-1/2	183
39. Pair in lining with coat.	Singer 12W-207	12	1	275
40. Baste under.	Singer 24-33	15	2	138
41. Sew round.	Singer 96-87	10	1-1/2	183
42. Fasten tapes.	Not done			
43. Press tapes.	Hoffman	3-15	1	275
44. Press edge seam open.	Hoffman	3-15	1-1/2	183
45. Trim facings and turn out.	Singer 96-45	12	2	138
46. Baste edges.	Singer 24-33	15	2	138
47. Bluff edges.	Not done			
48. Fasten bottoms.	Singer 12W-209	12	1	275
49. Flat baste facing.	Singer 12W-209	12	1	275
50. Baste lining.	Singer 12W-209	12	1-1/2	183
51. Fasten facings.	Singer 241-3	3	1	275
52. Stitch edges.	Singer 241-3	3	1-1/2	183
53. Fell lining side seams and bottoms.	Lewis 30-21 Lewis 17-10	10 10	1-1/2	183
54. Trim canvas at armhole and baste shoulder and gorge.	Hand		2	138
55. Close shoulders.	Singer 241-3	3	1	275
56. Press open shoulders.	Hoffman	3-15	1	275
57. Mark neck inlay.	Not done			
58. Seam under-collar and canvas.	Singer 96-87 Singer 241-3	10) 3)	1	275

Plant I - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
59. Press seam.	(See 61)			
60. Pad under-collar.	U.S. Blindstitch	10	1	275
TOP-COLLAR				
61. Press and stretch top-collar.)				
62. Shape top-collar.) (61,62,59))	Hoffman	3-15	1	275
63. Pair in top- and under-collar with coat.	Hand		1/2	275
64. Baste on under-collar.	Union Special 1900 Singer 24-33	12) 12)	2	138
65. Press in under-collar.	Not done			
66. Shape under-collar.	Hand		1	275
67. Fasten bridles and baste.	Singer 12W-209	10	3	92
68. Draw breaks.	Not done			
69. Fell under-collar.	Hand		5	55
70. Fell collar edge.	Hand		4	70
SLEEVE				
71. Close forearm seam. (71,77)	Singer 96-87	10	2-1/2	110
72. Press forearm seam. (72,78)	Hoffman	3-15	1-1/2	183
73. Tack cuff canvas.	Not done			
74. Mark and sew vent.	Not done			
75. Baste cuff.	Not done			
76. Press cuff.	Not done			
77. Sew hindarm seam.	(See 71)			
78. Press hindarm seam.	(See 72)			
SLEEVE LINING				
79. Close sleeve lining seams.	Singer 96-87	10	1	275
80. Pair in sleeve lining. (80,84)	Singer 96-87	10	1	275
81. Tack sleeve lining to cuff.	Not done			
82. Baste sleeve lining to cuff.	Not done			
83. Turn and press sleeve.	Not done			
84. Pair in sleeves.	(See 80)			
85. Sew in sleeves.	Singer 96-87	10	2-1/2	110
86. Press armhole.	Hoffman	3-15	2-1/2	110

Plant I - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment: Name and model number	Machinery and equipment: Average age	Number of workers	Worker's output per 8-hr. day
87. Baste armhole and tack.	Singer 12W-209	10	2-1/2	110
87(a). Insert pad.	Singer 12W-209	10	6	46
88. Felling (finishing)	Hand		18	16
89. Mark and cut buttonholes.	Hand		1	275
90. Make buttonholes.	Hand		10	28
91. Pull bastings.	Hand		4	70
92. Press edges.	Hoffman		2	138
93. Press collars and shapes.)				
94. Remove impressions of collars and shapes.)	Hoffman		2	138
95. Press fronts.	Not done			
96. Mark.	Hand		1	275
97. Press elbows.)			5	55
98. Press sleeves.)				
99. Press side seams.)				
100. Press backs.)	Hoffman	3-15	7	38
101. Press shoulders. and armholes.)				
102. Touch up with Hand Iron.)	Hoffman			
103. Roll lapels.)	Finish Pressing		10	28

Plant I - Men's Winter Suits - Continued

Operations on vests	Machinery and equipment: Name and model number	Machinery and equipment: Average age	Number of workers	Worker's output per 8-hr. day
FOREPARTS				
1. Sew darts. (1,13)	Singer 96-10	15	1	120
2. Press darts and welts.	(See 22)			
3. Trim welts, facings.	Hand		1	120
4. Make welts.	(See 8)			
5. Sew on welts.	(See 27)			
6. Cut open pocket mouth.	Hand		1/2	120
7. Press open welt seams.)				
8. Tack pockets. (7,8,4))	Singer 55-5	15	1	120

Plant I - Men's Winter Suits - Continued

Operations on vests	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
9. Sew round welt pockets.	Singer 96-10	15	1/2	120
10. Baste wiggin by machine. (10,15)	Singer 96-87		1	
11. Press foreparts.	Not done			
12. Trim canvas and shape bottom.	Not done			
13. Mark shape, assemble lining and front.	(See 1)			
14. Baste under by machine.	Not done			
15. Baste armhole by hand.	(See 10)			
16. Join neck and sew tape.	Singer 96-45	12	1/2	120
17. Pull bastes and turn vests.	Hand		1/2	120
18. Stitch edges.	Singer 55-5	15	1	120
19. Press shoulder pleats.	Not done			
20. Baste sides and shoulders.) 21. Trim sides and shoulders.)	Singer 55-5	15	1/2	120
22. Press front edges and darts. (22,2))	Hoffman		1/2	120
23. Join backs and fronts.) 24. Join sides and shoulders.)	Singer 96-87	10	1	120
25. Fell necks.	Hand		1	120
26. Remove size ticket.	(See 37)			
27. Mark buttonholes. (27,5)	Hand		1	120
28. Make buttonholes.	Reece Buttonhole, Hand	10	3	40
29. Bar tack, if machine hole.	Singer 68-10	10	1/2	120
30. Baste backs.	Not done			
31. Stitch backs.	Not done			
32. Pull bastes from backs.	Not done			
33. Press-off backs.) 34. Press-off fronts.)	(See 42)			
35. Mark for and count buttons.	Hand		1-1/2	80

Plant I - Men's Winter Suits - Continued

Operations on vests	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
36. Sew on buttons and tickets.	Hand		1-1/2	80
37. Brush and clean. (37,26)	Hand		1	120
LININGS				
38. Make linings.	Singer 96-10	15	1/2	120
BACK				
39. Make backs. (1st operation)) 40. Make backs. (2nd operation))	Singer 96-10	15	1/2	120
41. Press backs. (41,33,34)	Hoffman		1-1/2	80

Plant I - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
1. Serge in and out leg seams and fork run, taking in fork stay.	Merrow 60W	10	1	340
2. Sew in pleats.	Not done			
3. Press pleats.	Not done			
4. Sew on pocket facing, turning in; (bottom of facing shaped). (4,30)	Singer 96-87	10	1	340
5. Sew pockets and facing to front; nick seam at both ends of stitching.) 6. Turn back, pipe, turn in and sew down inside edge of pocket facing.) 7. Sew pocket, tack mouth top and bottom; nick facing of pocket below bottom; tack and pair off surplus facing at top. (5,6,7,31))	Singer 96-87	10	3-1/2	100

Plant I - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
8. Sew zip to left fly on twin needle taking in lining; sew right fly to zip.	Singer 96-87	10	1-1/2	230
9. Trim zip level with top of fly; sew jean stay to left fly top.				
10. Sew fly lining to right fly.	Singer 96-87	10	1	340
11. Nick front for fly; sew left fly to fronts.	Singer 96-87	10	1	340
BACKS				
12. Serge in and cut leg seams, taking in pocket stay on side seam; serge seat seam.	Merrow 60W	10	1	340
13. Sew darts.	Singer 241-3	3	1/2	340
14. Press darts.	Hoffman		1/2	340
15. Mark hip pockets.	Not done			
16. Lay pocket, back and facing with drilled holes in pocketing in line with hip pocket mark; sew across on twin needle m/c with knife between needles cutting as sewing.	Singer 241-3	3	4	85
17. Make bottom welt; turn in facing and sew down in pocket.				
18. Sew each side of pocket, using knife trimmer.				
19. Turn out hip pocket; catch ends; insert tab on left hip only; loop for button.				
20. Sew button to hip pocket. (L)	(See 32)			
21. Sew round hip pocket.	Singer 241-3	3	1	340

Plant I - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
22. Pair in backs and fronts; insert garment ticket, in hip pocket.	Not done			
23. Close side seams from top to bottom.	Singer 241-3	3	2-1/2	136
24. Make belt loops for waistband.	Singer 147-39	15	1/2	340
25. Sew on waistband, in inclusing 6 or 7 belt loops and side pleats and hip pockets. (25,27)	Singer 241-3	3	2-1/2	136
26. Press open seam at pocket mouth, turn over and press down lip of pocket, press waistband seam, press over right fly seam, press back left fly.	Hoffman	3-15	1-1/2	220
27. Bar-tack loops on waistband.	(See 25)			
28. Sew round side pocket; close pocket to stay.	Singer 241-3	3	1	340
29. Serge left fly.	Not done			
30. Make watch pocket by serging machine.	(See 4)			
31. Sew on watchpocket to top of waistband.	(See 5)			
32. Put in buttons on waistband. (32,20)	Singer 75-60	10	2	170
33. Corner left and right flys.	Singer 241-3	3	2	170
34. Fell on waistband lining. (33,34,36)				
35. Sew side of watch-pocket to waistband lining.	Not done			
36. Sew on edge of right fly to waistband lining.	(See 33)			

Plant I - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
37. Press waistband lining and press seam of right fly lining.	Hoffman	3-15	1-1/2	340
38. Stitch left fly.	(See 42)			
39. Check waist measure. 40. Sew back seam, beginning 3 in. from crotch and make vent.	Singer 96-87	12	1	340
41. Sew on 6 suspender buttons, inserting button stay to each.	Singer 75-60	15	1/2	340
42. Stitch down waistband lining and close right fly edge. (42,38)	Singer 241-3	3	3	136
43. Bar-tack loops thru waistband.	Singer 68SV-45	10	3	115
44. Close in-leg seams.	Singer 241-3	3	1	340
45. Close crotch seam.	Not done			
46. Put on zip runner and staple end of zip.	Zipper Machine		1/2	340
47. Tape crotch.	Singer 96-87	12	1/2	340
49. Press side seam, in-leg seams, and back seams.	Not done			
48. Bar-tack fly.	Singer 68-32	10	1	340
50. Clean, sew on tickets and remove Soabar tickets.	Hand		3-1/2	100
51. Press legs.	Hoffman		1	340
52. Press round top.	Hoffman		1	340
53. Pink bottoms.	Not done			
54. Examine and clean stains.	Hand		1	340

Table 15. Operations, equipment, number of workers, and output of men's winter suits per 8-hour day in the making department of nine selected plants, U.S.A., 1950

Plant J* - Men's Winter Suits

Operations on sack coats	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
FOREPARTS				
1. Pipe seams.	Singer 241-12	6	2	839
2. Sew darts.	Singer 96-40, 96-80	10	4	492
3. Tape front armhole fore and shoulder.	na		7	369
4. Press darts.	Hoffman Steam Jumper	10	4-1/3	716
POCKETS				
5. Make welt.	Singer 241-12, 241-3	6	29	64
6. Mark welt.				
7. Sew on welt.				
8. Piece pocket.				
9. Sew on welts.	Not done			
10. Cut mouth and press open.	Not done			
11. Finish pockets.	Singer 96-45, 245-4	10		
12. Baste pocket mouth.	Singer 55-20, 107W-3, Zig Zag S.M.			
13. Press pockets.	Hoffman TP-1	4	2	811
BACKS				
14. Pipe seams.	Singer 241	6	3	611
15. Close back seam. (14,15,20)			1-1/2	1,261
16. Make lining. (16, 33-37)	Singer 241-3 Singer 241-12	10 4	15	103
17. Press lining. (17,38)	Hoffman Steam Jumper V-1		2-2/3	537
18. Baste.	Hand		18	95

*Plant J - This plant employs over 1,000 workers. It is an inside shop using a combination of production methods, and manufactures grade 3+ men's suits, topcoats, overcoats, slacks, and sport jackets. The plant comprises sponging, shrinking and finishing, cutting and making departments. Worker's output is based on actual time. All machines are unit driven. Production is planned to make 1,700-2,000 suits per day.

Footnote at end of table.

Plant J - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
19. Pair in back and fore parts.	Hand		4	628
20. Close side seams.	(See 14 and 15)			
21. Tape back armhole.	Union Special 6500NZ	3	2	985
22. Press side back and armholes.	Hoffman Steam Jumper VFB-2	15	4	646
FRONTS				
23. Press canvas.	Hoffman Steam Press ST-6	10	1	2,775
24. Pair in canvas.	Hand	na		
25. Mark break.	Hand			
26. Canvas fore parts.	na		6	304
27. Baste on bridle.	Singer 55-20	6	2	1,130
28. Pad lapels and bridle.	American Model #9	6	5-1/2	430
29. Press fronts.	New York NC-6 Hoffman ST-6	10	3	692
30. Shape.	Hand		6	310
31. Cut round canvas.	Hand		1/2	3,000
32. Pipe bottoms.	Singer 241-12	6	1	1,615
33. LINING				
33. Piece up lining.	(See 16)			
34. Piece lining pocket.				
35. Make lining pocket.				
36. Sew round lining pocket.				
37. Stitch stay.				
38. Press lining.	(See 17)			
39. Pair in lining with coat.	Hand		3/4	1,970
40. Baste under.	Hand		10	202
41. Sew round.	Not done			
42. Fasten tapes.	Singer 245-4, 96-45	2-4 10-15	7	369
43. Press tapes.	Hoffman TDO	4-15	1-1/2	1,279
44. Press edge seam open.	Not done			
45. Trim facings and turn out.	Hand		5	397
46. Baste.	Union Special 1900	15	6	294
47. Bluff edges.	Not done			
48. Fasten bottoms.	Not done			

Footnote at end of table.

Plant J - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
49. Flat baste facing.	na		4	532
50. Baste lining.)	Singer 12W-112	5	1-4/5	1,117
51. Fasten facings.)				
52. Set edges.	Not done			
53. Fell lining side seams and bottoms.	Side - Lewis 30 Bottom - Lewis 170-2	2	1-1/2	1,408
54. Trim canvas at armhole, shoulder and gorge.	Union Special 15800	15	1-3/4	929
55. Close shoulders.	Singer 241		3	554
56. Press open shoulders.	Hoffman Steam Jumper	10	2	821
57. Mark neck inlay.	Hand		1	1,516
58. Seam under-collar and canvas.	Singer 241-3	10	3/4	1,895
59. Press seam.	Hoffman Steam Jumper	5	1/4	5,190
60. Pad under-collar.	American Model #9	4	1	1,238
TOP-COLLAR				
61. Press and stretch top-collar.	New York N1540	15	3/4	2,513
62. Shape top-collar.	Hand		1	1,663
63. Pair in top- and under-collar with coat.	Hand		1/3 1/4	6,050 2,290
64. Baste on under-collar.	Union Special 1900KZ	15	11	180
65. Press in under-collar.	New York N1540	10	na	na
66. Shape under-collar.	Hand		3	717
67. Collar closing.	Hand		25	72
68. Draw breaks.	Not done			
69. Fell under-collar.	Lewis Model 1634	4	1	1,238
70. Fell collar edge.	Hand		2	756
SLEEVE				
71. Close forearm seam. (71,74,75,77)	Singer 241, Singer 96	10	9	168
72. Press forearm seam.	Hoffman U-1 or LCF-7	10	2	897

Footnote at end of table.

Plant J - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
73. Tack cuff canvas.	na		1	1,712
74. Mark and sew vent.	(See 71)			
75. Baste cuff.	(See 71)			
76. Press cuff.	New York M1040	10	1	1,497
77. Sew hindarm seam.	(See 71)			
78. Press hindarm seam.	Hoffman VG-2		2	824
SLEEVE LINING				
79. Close sleeve lining seams.	Singer 96-40	10	2-1/2	746
80. Pair in sleeve lining and turn sleeve.	Hand		1	2,030
81. Tack sleeve lining to cuff.	Lewis 1626	4	3-1/2	496
82. Baste sleeve lining to cuff.	Hand		2	901
83. Turn and press sleeve.	Not done			
84. Pair in sleeves.	Hand		1	1,765
85. Sew in sleeves.	Singer 96-40, 241-3	15 10	8	195
86. Press armhole.	Hoffman Steam Jumper G-3	6-7	6	447
87. Baste armhole and insert pad.	Union Special 15800KZ	10	18	106
88. Felling.	Hand	na	na	na
89. Mark and cut buttonholes.	Hand		na	1,449
90. Make buttonholes.	(Lapel buttonhole) Singer 99W 110, 99W-130	3) 5)	4	747
91. Pull bastings.	Hand		1-1/2	1,249
92. Press edges.	Hoffman PX09	8	3	462
93. Press collars and shapes and roll lapels. (93,103)	Hoffman VK-2 New York NK-2	6-8 15-18	9 8	209 219
94. Remove impressions of collars and shapes. (94,102)	Hand Sponging Operation		18	95
95. Press fronts.	Hoffman VO-21 (9 left, 9 right)	10	6-1/3	292
96. Mark buttons.	Hand		2	1,430
Sew buttons.	Hand		12	234

Footnote at end of table.

Plant J - Men's Winter Suits - Continued

Operations on sack coats	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
97. Press elbows.	Hoffman Bg-9	15	2-1/2	727
98. Press sleeves.	Hoffman VU-9	5	3-1/2	496
99. Press side seams.) 100. Press backs.)	Hoffman Shape Presser BU-4		14	129
101. Press shoulders and armholes.	Hoffman VG-5	4-15	18	94
102. Touch up with Hand Iron.	(See 94)			
103. Roll lapels.	(See 93)			

na Not available

Plant J - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
FRONTS				
1. Serge in and out leg seams and fork run, taking in fork stay. (1,12)	Union Special 39200J, Singer 246-2	4 1	1/3	940
2. Sew in pleats.	Singer 96-47	10	na	na
3. Press pleats.	New York Steam Iron & Hot Buck Jumper U-2	10 10	1/2	2,330
4. Sew on pocket facing, turning in; (bottom of facing shaped).			2	1,040
5. Sew pockets and facing to front; nick seam at both ends of stitching.				
6. Turn back, pipe, turn in and sew down inside edge of pocket facing.	Singer 96-47	10	14	167

Footnote at end of table.

Plant J - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
7. Sew pocket, tack mouth top and bottom nick facing of pocket below bottom; tack and pair off surplus facing at top.	Singer 96-47	10	14	167
8. Sew zip to left fly on twin needle taking in lining; sew right fly to zip.	Singer 112W140	6	1 1-1/3	1,900 1,510
9. Trim zip level with top of fly; sew jean stay to left fly top.				
10. Sew fly lining to right fly. 11. Nick front for fly; sew left fly to front.	Singer 96-45	6	3-3/4	615
BACKS				
12. Serge in and out leg seams, taking in pocket stay on side seam; serge seat seam.	(See 1)		2-1/3 1/4	869 1,642
13. Sew darts.	Not done			
14. Press darts.	Not done			
15. Mark hip pockets.	na			
16. Lay pocket, back and facing with drilled holes in pocketing in line with hip pocket mark; sew across on twin needle m/c with knife between needles cutting as sewing.	Singer 96-47 (Single needle used, cut with scissor)		12	179
17. Make bottom welt; turn in facing and sew down in pocket.	na			
18. Sew each side of pocket, using knife trimmer.	Singer 96-47	10	na	na

Footnote at end of table.

Plant J - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
19. Turn out hip pocket; catch ends; insert tab on left hip only; loop for button.	Singer 96-47	10	na	na
20. Mark and sew button to hip pocket. (L)	na		1	2,480
21. Sew round hip pocket.	Singer 96-47	10	3	666
22. Pair in backs and fronts insert garment ticket, in hip pocket.	Hand		na	na
23. Close side seams from top to bottom.	Union Special 51-200	6-10	3	642
24. Make belt loops for waistband.	Union Special Blindstitch 88BL	11	1	2,419
25. Sew on waistband, including 6 or 7 belt loops.	Singer 96-47	10	7-1/4	280
26. Press open seam at pocket mouth, turn over and press down lip of pocket, press waistband seam, press over right fly seam, press back left fly.	New York Jumper U-2	6-8	3-1/2 1-1/2	994 1,228
27. Bar-tack.	Singer 69-8	5	3	685
	68-32			
	68-39		na	na
28. Sew round side pocket to stay.	Singer 96-47	10	3	705
29. Serge left fly.	Singer 246-2	1	1	2,090
30. Make watchpocket by serging machine.	Merril 60HW	15	1/30	3,104
31. Sew on watchpocket to top of waistband.				
32. Put in snaps on waistband.	Scovill Snap Machine	2	1 1	2,030 2,045
33. Corner left and right flys.	Singer 96-40	10	2	1,025

Footnote at end of table.

Plant J - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
34. Fell on waistband lining.	Lewis 1641	1	2	1,025
35. Sew side of watch-pocket to waistband lining.				
36. Sew on edge of right fly to waistband lining.	Singer 96-47	10	na	na
37. Press waistband lining and press seam of right fly lining.	New York Jumper Press	6	3	962
38. Stitch left fly.	Singer 96-47	10	2	1,036
39. Check waist measure.				
40. Sew back seam, beginning 3 in. from crotch and make vent.	Singer 51-300	1-2	2-1/6 1	946 1,990
41. Sew on 6 suspender buttons, inserting button stay to each.	Not done			
42. Stitch down waistband lining and close right fly edge.	Singer 96-47	10	na	na
43. Bar-tack loops thru waistband.			5	652
44. Close in-leg seams.)	Singer 253-2	2	5	417
45. Close crotch seam.)			1/2	853
46. Put on zip runner and staple end of zip.	Scovill Zipper Talon Zipper	1 Rent	2 1	1,132 2,260
47. Tape crotch.	na		5-1/4	396
48. Bar-tack fly.	Singer 68-32	23	1	2,177
49. Press side seam, in-leg seams, and back seams.	Zacharias Steam Press	6	4	573
50. Clean, sew on tickets and remove Soabar tickets.	na		4	536
51. Press legs.	New York Press NL-4	10	5	481

Footnote at end of table.

Plant J - Men's Winter Suits - Continued

Operations on pants	Machinery and equipment		Number of workers	Worker's output per 8-hr. day
	Name and model number	Average age		
52. Press round top.	New York Press NL-10	10	4-3/4	531
53. Pink bottoms.	na			
54. Examine and clean stains.	na			

na Not available.

Table 16. Man-hour requirements and characteristics of indirect labor in 10 selected men's winter suit plants, U.S.A., 1950

Plant	Grade	Indirect man-hours per suit				Number of indirect operations performed		
		Total	Cutting department	Making department	Non-departmental	Cutting	Making	Non-departmental
A	4	.715	.192	.196	.327	5	2	4
B	4	1/ .797	.093	.257	.447	3	2	5
C	4	1/ .715	.092	.259	.364	7	3	8
D	3	.670	.048	.300	.322	3	2	5
E	4	1.654	.194	.292	2/ 1.168	6	2	6
F	2+	1/ 1.254	.144	.416	2/ .694	6	3	5
G	4+	(3)/	(3)/	.244	.385	6	2	4
H	5	2.075	.585	.283	1.207	6	3	7
I	4	.767	.207	.366	.194	3	4	5
J	3+	.667	.069	.214	.384	4	3	8

Plant	Grade	Production method	Number of employees in plant	Percent of indirect to total plant employees
A	4	Bundle	450-500	7.7
B	4	Bundle	250-300	11.2
C	4	Progressive bundle	over 1,000	12.3
D	3	Progressive bundle	over 1,000	12.8
E	4	Bundle	250-300	2/ 21.4
F	2+	Bundle	500-550	2/ 15.1
G	4+	Progressive bundle	over 1,000	8.3
H	5	Combination	900-1,000	10.7
I	4	Bundle	350-400	7.7
J	3+	Combination	over 1,000	13.4

1/ Man-hours shown are for a 2-piece suit.

2/ Non-departmental indirect man-hours includes time spent in servicing other shops of the plant not covered by this survey. The hours for the shops reporting cannot be separated from the total indirect man-hours; therefore, indirect unit man-hours are overstated.

3/ Data not available.

Table 17. General characteristics of the buildings occupied by 10 men's winter suit plants, U.S.A., 1950

Plant	Number of shops	Area (square feet)		Percent storage to total area
		Total	Production	
A	4	62,000	50,000	16.1
B	3	55,000	46,000	16.4
C	6	a)110,000	50,000	(1)/
		b) 50,000	50,000	
		c) 25,000	25,000	
D	5	160,000	125,000	16.9
E	5	55,000	31,000	14.5
F	6	82,500	59,500	18.2
G	10	800,000	550,000	25.0
H	3	175,000	91,500	18.9
I	3	40,000	(1)/	(1)/
J	6	a)301,000	156,000	19.2
		b)180,000	108,000	19.2

	Area per production worker (square feet)	Age of building	Has plant been	
			Specially designed	Engineered
A	112	35	No	No
B	178	24	Yes	No
C	100	a)55	No	No
		b)35	Yes	No
		c)30	Yes	No
D	102	40-50	No	Yes
E	127	70	No	No
F	131	50	Yes	No
G	180	5	Yes	No
H	110	30-35	No	Yes
I	(1)/	40	No	Yes
J	209	38	No	Yes

1/ Data not available.

Indirect Labor Operations

Occupations usually classified as departmental indirect in the men's winter suit industry are foremen, cutting clerks, ticket sewers, and floor boys in the cutting department; and foremen and bundle boys in the making department. Non-departmental occupations are general maintenance men, machine repairmen, shipping and receiving clerks, label sewers, stock clerks, and final examiners. If the company owns the plant's building, elevator operators and guards are also classified in the latter group.

Although indirect labor constitutes a small percentage of total labor, improvements in the utilization of indirect labor are important to increased productivity. One indirect worker services workers performing direct operations. The introduction of an additional indirect function may increase the productivity of many direct workers. In fact, as the manufacturing operation is enlarged and becomes more integrated, a larger ratio of indirect to total labor results and more efficient use of direct labor is accomplished.

Factory overhead is affected by such factors as the structure of the building, the layout of the work stations, the materials handling equipment, the extent of quality control, and the degree of specialization. Tables 16 and 17 show some characteristics influencing indirect labor.

Case Study Data on
Productivity and Factory Performance

MEN'S WINTER SUITS AND TOPCOATS

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CHAPTER III: CASE STUDIES--TOPCOATS

Description of a Topcoat

A topcoat is a lightweight outercoat or overcoat. Topcoat fabrics weigh from 14 to 20 ounces per yard, and are generally 54 inches wide. Overcoats are made of heavier fabrics-22 to 32 ounces per yard-generally 54 inches wide. Another difference between topcoats and overcoats is that overcoats are usually fully lined whereas topcoats are partially lined or have removable "zip-in" linings. The paddings and trimmings in a topcoat are also lighter in weight.

Topcoats are made in either single or double-breasted models. The single-breasted have either a fly front (with concealed buttons and buttonholes), or an exposed button front called a "button-down" front. The double-breasted models nearly always have the button-down front. Zip-in linings are usually either a plain tan or grey wool for gabardines, and a plaid for worsteds or woolens. Standardization of this item is practical since the zip-in lining is invisible when the coat is worn.

Topcoats are made in a variety of shoulder models with Raglan and box shoulders predominating. The half-belt on the back is also a feature on some of the drape or form fitting models. Most topcoats, except some rainwear models, have a vented back, that is, an opening in the lower rear part of the coat. The usual type of outside pockets are slash pockets and patch pockets. An inside letter pocket, and outside breast or handkerchief pocket, and a coin or ticket pocket are common features.

Topcoat Materials. Topcoats are made of either woolens or worsteds. Typical woolens are tweed, homespun and twists. Examples of worsteds are serge, gabardine, sharkskin, and unfinished worsteds. Some materials such as covert, cheviot, and flannel may be either worsted or woolen. Worsted yarns are made from the finest and longest wool fibers, combed parallel and twisted together making yarn that is even, strong, and firm. Woolen yarns are made of coarser fibers than worsted; fibers are both short and long, and crisscrossed in the yarn -- not combed and laid parallel. Most woolen yarns are one ply and loosely twisted. Woolens lend themselves to more casual styling than do worsteds. Generally, woolens have a soft finish and are less firmly woven than worsteds, so they neither keep their shape nor press as well as worsteds.

Most topcoat fabrics are made of wool from sheep or hair from such animals as goats (cashmere and mohair), camels, alpacas, and vicunas. Wool is often combined with other fibers such as cotton or synthetic fibers to supply specially desired characteristics in wear and in manufacture.

Collection and Presentation of Data

The preparation of these survey data involved three major steps. A schedule (see appendix II) was prepared with the advice and counsel of recognized authorities in management, labor, and trade associations. The schedules were taken to the cooperating companies, where the essential information was obtained by personal conferences with officials, and from the companies' records and experience. Finally the information obtained was arranged into case method studies or statistical composites, as here presented.

Departmental Operations

Detailed descriptions of the manufacturing operations by department are shown for those plants in which they are performed. (See tables 18, 19, and 20.) There are three departments; sponging, shrinking, and finishing is the first department, cutting the second, and making the third. Operations in these three departments were analyzed and divided as follows: 3 to 5 sponging, shrinking, and finishing operations; 4 to 11 cutting operations; and 75 to 182 making operations. In addition data were collected on machinery used, number of workers, and worker's output per 8-hour day.

The list of operations does not reflect accurately the exact operations in each plant, since they vary with the model and style of garment being produced. Therefore, where a plant's operations would not fit in with the listed operations, the list was modified to include the changes, and in some cases the operations list was printed as submitted by the manufacturer or contractor. Operations in the making departments are not always followed in the sequence shown since some plants manufacture various parts of the garment simultaneously. The same part of a coat may be made by different methods. For example, some firms make a "sandwich" collar, i.e., a collar which is made as a unit and then attached to the coat. Others make an "open" collar, which is a collar that is built into the coat as the parts are assembled. Still others make a semi-open collar, which contains elements of both the "sandwich" and the "open" collar. Plants which have been "engineered" or specifically designed for the manufacture of men's topcoats use a much more logical sequence of operations than plants which have just grown through the addition of machines and employees.

In general, only the largest plants in the industry can profitably perform all of the operations requisite for the manufacture of a man's topcoat, e.g., sponging, shrinking, finishing, cutting, and making. The smaller plants usually find it more feasible to contract out one or more of the manufacturing functions, such as shrinking or making. Others contract out the manufacture of specific parts such as shoulder pads and canvas fronts, or even specific operations such as felling or making buttonholes.

A detailed description of the various departmental operations are given in Chapter IV. In the following tables data are given for all the operations necessary to manufacture a topcoat in the six different plants making them.

Table 18. Equipment and number of workers in the sponging, shrinking, and finishing department in Plant W 1/, a man's topcoat manufacturing plant, U. S. A., 1951

Operation	Equipment	Number of machines	Number of workers
Cloth examining	---------	--	10
Sponging	Curtis and Marble	10	7
Decatizing.	Curtis and Marble	2	4
	Gessner	3	
Cold water shrinking .	Gessner	2	2
Winding	Windel	2	3
	Parks and Woolson	2	

1/ This department processes 22,500 yards of cloth per 8-hour day. The workers in this department are paid on an hourly basis.

Table 19. Equipment, number of workers, and worker's output per 8-hour day, by operation, in the cutting department in three selected plants, U. S. A., 1951

Plant W 1/

Operation	Equipment	Number of machines	Number of workers	Worker's output of topcoats per 8-hour day
Spreading and marking	Cutting Room Appliance Corp. Model TT547-60	2	(2/)	
	Hand Spreading Machines constructed by company's maintenance department	22	(2/)	100
Cutting	Eastman-Maimin-Wolfe straight knife cutting machine			
	6 inch blade	11	(2/)	
	8 inch blade	20	(2/)	
	Round knife cutting machine			200
	5 inch blade	8	(2/)	
	6 inch blade	20	(2/)	
Fitting	Beaver	6	(2/)	200
	Eastman	12	(2/)	
Assembling . . .		--		1000

See footnotes at end of table.

Table 19. Equipment, number of workers, and worker's output per 8-hour day, by operation, in the cutting department in three selected plants, U. S. A., 1951 --Cont.

Plant X

Operation	Equipment	Number of machines	Number of workers	Worker's output of topcoats per 8-hour day
Spreading	(Hand)	(2/)	(2/)	200
Marking	(Hand)	(2/)	(2/)	200
Machine cutting . . .	Maimim (Automatic xx)	(2/)	(2/)	200
Hand cutting	(Hand)	(2/)	(2/)	9
Ticketing and assembling	Soabar	(2/)	(2/)	200
Lining cutting . . .	Wolf #70	(2/)	(2/)	200

Plant Y3/

Operation	Equipment	Number of machines	Number of workers	Worker's output of topcoats per 8-hour day
Spreading	C.R.A. Automatic)	(2/)	8	(2/)
Marking	Hand)			
Machine cutting . . .	Rotary and straight knife)			
Ticketing	Soabar	(2/)	19	(2/)
Assembling and other operations 4/. . . .		(2/)	38	(2/)

1/ This cutting department cuts men's topcoats, overcoats, suits, and slacks, as well as women's suits and coats. The number of machines and of workers is reported for the entire shop when producing all products. Output per worker's 8-hour day is for topcoats only. Average age of machines is three years.

2/ Data not available.

3/ Operational times for Plant Y are not reported since a breakdown is not available for individual products; topcoats, suits, sport coats, and slacks.

4/ Occupations included are: Cutting clerks, piece goods clerks, piping boy, and lining pickers.

Table 20. Equipment and worker's output per eight-hour day in the making department of six selected men's topcoat plants, U. S. A., 1951

Plant U*

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 2/
	Machine and model	Type drive 1/	
PARTS			
1. Line, turn & gauge stitch cuffs . . .	Singer 96-10	G	200
2. Press cuffs .	Hoffman TK-2		400
3. Canvas make .	(Purchased made)		
4. Set label to yoke (lining) . . .	Singer 96-10	G	560
5. Face lining pocket, set size ticket & label (Done with 8) 3/. . .		)	
6. Pipe inside pocket slash . . .	(Not done)	)	75
7. Make inside pocket (complete) and		)	
8. Join & bottom hem back lining. Join lining foreparts to yoke, turn bottom of yoke & stitch and sew on union label. (Also 5)	Singer 96-10	G)	
9. Face & set lining to side pockets (2)	(Not done)		
10. Pipe side pockets	(Not done)		

*This is an inside shop, making a grade 4 topcoat by the bundle system of production. It makes only men's topcoats. The plant has a cutting and a making department. Sponging, shrinking and finishing are done outside on contract. This plant is in the 100-150 total employee size group and output is 125 coats a day. Average age of machinery is 5 years.

See footnotes at end of table.

Table 20. Plant U--Continued

Making department operation	Equipment Machine and model	Type drive 1/	Worker's output of topcoats per 8-hour day 2/
SLEEVES			
11. Outseam sleeves & linings "Sleeve-makers" (Also 14, 15)	Singer 96-10	G	125
12. Baste cuffs to sleeves. .	Singer 96-20	G	250
13. Stitch cuffs.	Singer 96-10	G	300
14. Join sleeve & lining at cuff end (Done with 11)			
15. Inseam sleeves & linings (Done with 11) . .			
16. Press seams	Hoffman LCF 7		550
17. Tack lining to sleeves & turn	(Hand baste)		125
18. Sew buttons on coat . . .	(Hand)		80
19. Trim sleeve linings . . .	(Not done)		
20. Inspect	(No inspection at this point)		
UNDERCOLLAR			
21. Piece undercollar canvas	Singer 96-10	G	2880
22. Piece undercollar	Singer 96-10	G	1200
23. Press seams	Hoffman LCF 7		1280
24. Stitch undercollar . . .	Singer 96-10	G	2000
25. Blind stitch undercollar (Padding) . . .	Lewis 62L-1 and Amer. Blind Stitch	G	1000
26. Trim undercollar canvas	(Hand shears)		800
27. Collar shaping	(Hand)		160
COLLAR			
28. Join collar to undercollar	(Not done)		
29. Trim & turn	Make open collar		
30. Gauge stitch	(See 21-26 above)		
FRONTS			
31. Join facings to yoke facing	(Done by lining maker)		
32. Pipe front facing and yoke	(Not done)		
33. Pipe fronts	(Not done)		
34. Pocket making (slash pockets)	Singer 96-10	G	75

See footnotes at end of table

Table 20. Plant U--Continued

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 2/
	Machine and model	Type drive 1/	
35. Pipe pocket openings	(Not done)		
36. Set pockets & edge-stitch welts	(Not done)		
37. Set bellows to facings	(Not done)		
BACKS			
38. Pipe (right) center back	(Not done)		
39. Pipe left vent	Singer 96-87	G	800
40. Tape & gauge stitch left vent and			
41. Sew lining to right vent and		))	
42. Center seam back & tack	Singer 96-10	G)	
vent & tape on armholes	Singer 96-10	) G)	70
43. Press lining (vent) and center seam	Hoffman TU-11		400
44. Finish vent lining	(11 hand finishers do whole coat)		64
44a. Machine hem	Lewis 17-10	G	400
ASSEMBLY			
45. Pair fronts and backs "join coat"	(Hand)		960
46. Side seam		)	
47. Top-stitch seams	Singer 96-10	G)	100
48. Press seams	Hoffman TU-11		200
49. Baste canvas front and trim canvas and put in pads.	Singer 12W-212	U	100
50. Pad lapel & tack inside	American Blind Stitch 62L-1	G	125
50a. Press front	Hoffman VT31R		400
51. Shape front pocket		)	
	Hand	)	120
52. Trim canvas		)	
53. Baste facing to front (first baste)	Singer 12W-212	U	160
54. Tape front "sew tape".	Singer 245-4	G	125
55. Blind stitch tape "fell tape".	Lewis 150-1	G	125
56. Press tape	Hoffman LJ-13		250
57. Pipe bottom	Singer 96-87	G	350-400

See footnotes at end of table.

Table 20. Plant U--Continued

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 2/
	Machine and model	Type drive 1/	
58. Pull basting from facings	(Hand)		480
59. Baste edges and bottom	Singer 55-5	U	115
60. Second baste	(Not done)		
61. Stitch facings and linings	(Done by lining maker)		
62. Baste lining	(Hand)		40
63. Blind stitch lining . .	(Not done)		
64. Fell bottom & vent . . .	Lewis 17-10	G	300
65. Mark for buttonholes, pull bastings, open fly and cut	Reliable Hand Buttonhole Cutters		480
66. Make 4 buttonholes . . .	(Hand)		25
67. Make lapel buttonholes .	(Hand)		160
68. Tack buttonholes (Part of operation 66).			
69. Join shoulder.	Singer 96-10	G	480
70. Pair-in sleeves	(Hand)		1600
71. Sew in sleeves	Singer 96-10	G	110
72. Press shoulders and armholes	Hoffman LG15		400
73. Raise stitch armholes	(Not done)		
74. Armhole baste	Singer 12W-212	U	280
75. Join shoulder lining	(Hand)		100
76. Sew armhole and shoulder linings stitch in sleeve head and	Singer 111W-117	U)	100
77. Tack and trim armholes		)	
78. Trim collar and neck and	(Hand)	)	240
79. Set collar to lapel . .		)	
80. Collar baste	(Not done)		
81. Finishing	(Hand)		15
82. Single stitch	Singer 96-10	G	125
83. Remove bastings	(Hand)		80

See footnotes at end of table.

Table 20. Plant U--Continued

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 2/
	Machine and model	Type drive 1/	
84. Press and form undercollar	Hoffman TK-16		240
85 Press edges, collar, lapels and bottom vent	Hoffman TD-9		250
86. Press sleeves, body, lapels, armholes, and finish lining . . .	All Hoffman 2-VC04 (armholes) 3-BG5 (sleeves, lapels 2-VG38R (body)		120
87. Mark for button	(Hand)		240
88. Sew button	(Hand)		96
89. Clean and inspect coat	(Hand)		50
90. Bush (repair)	(As required)		50

1/ G = Group, U = Unit

2/ The worker's output per eight-hour day is the performance as actually reported by the plant. It does not represent the rated capacity of any machine which may be used in the operation.

3/ Numbers in parentheses indicate other operations included.

Table 20. Equipment and worker's output per eight-hour day in the making department of six selected men's topcoat plants, U. S. A., 1951

Plant V*

Making department operation	Equipment		Age	Worker's output of topcoats per 8-hour day 2/
	Machine and model	Type drive 1/		
PARTS				
1. Line, turn & gauge stitch cuffs . . .	Singer 241-3	L	10	200
2. Press cuffs	Hoffman cuff press	U	15	400
3. Canvas make	(Not done)			
4. Set label to yoke (lining). . .	(Not done)			
5. Face lining pocket	Singer 241-2	L	7	400
6. Pipe inside pocket slash and trim	Singer 245-3	L	7	200
7. Make inside pocket (complete) (also 34) 3/ . . .	Singer 245-3	L	7	80
8. Join & bottom hem back lining. .	(Not done)			
9. Face & set lining to side pockets (2)	Singer 241-2	L	10	200
10. Pipe side pockets .	Singer 245-3	L	7	400
SLEEVES				
11. Outseam sleeves & lining (11, 15). .	Singer 241-2	L	10	400
12. Baste cuffs to sleeves.	Singer 241-2	L	10	400
13. Stitch cuffs & make (complete). .	Singer 241-2	L	8	300
14. Join sleeve & lining at cuff ends	Singer 241-2	L	10	400
15. Inseam sleeves & lining (Done with 11)				

* This is a contract shop and makes coats for grade 3 manufacturers, by the bundle system of production. It makes only men's topcoats. Materials are supplied cut by manufacturer who receives finished coats. This plant is in the 150-200 total employee size group and output is 400 topcoats a day.

See footnotes at end of table.

Making department operation	Equipment: Machine and model	Equipment: Type drive 1/	Age	Worker's output of topcoats per 8-hour day 2/
16. Press seams	N. Y. pressing iron, slide-arm jumper	U	15	400
17. Tack lining to sleeves & turn . .	(Hand)			135
18. Sew buttons at cuffs (Done with operation 88) . . .				
19. Trim sleeve linings	(Not done)			
20. Inspect	(By supervisor)			
UNDERCOLLAR				
21. Piece undercollar canvas & trim and.	American Blind Stitch #4039	U	15	400
22. Piece undercollar .	Singer 245-3	L	7	
23. Press seams	N. Y. Pressing Iron	U		400
24. Stitch undercollar.	Singer 245-3			
25. Blind stitch undercollar	American Blind Stitch			
26. Trim undercollar canvas (24,25,26 by Operator doing 21)	(Hand)			
27. Collar shaping. . .	(Hand)			500
COLLAR				
28. Join collar to undercollar. . . .	Singer 55-20	L	20	400
29. Trim & turn	(Hand)			200
30. Gauge stitch . . .	(Hand)			135
FRONTS				
31. Join facings to yoke facing. . . .	(Not done)			
32. Pipe front facing (includes 33,38,39)	Singer 241-2	L	10	400
33. Pipe fronts				
34. Set pocket welts & slash (Included in operation 7). .				
35. Pipe pocket openings	(Not done)			
36. Edgestitch welts	Singer 245-3	L	5	200

See footnotes at end of table.

Table 20. Plant V—Continued

Making department operation	Equipment		Age	Worker's output of topcoats per 8-hour day 2/
	Machine and model	Type drive 1/		
37. Set bellows to facings.	Singer 241-2	L	7	200
BACKS				
38. Pipe (right) center back and. .				
39. Pipe left vent (Included in operation 32)				
40. Tape & gauge stitch left vent (Includes operation 42). . .	Singer 241-2	L	7	400
41. Sew lining to right vent	(Not done)			
42. Center seam back & tack vent (Included in operation 40)				
43. Press lining vent	N.Y. Pressing Iron, slide-arm jumper	U	7	400
44. Finish vent lining & hem.. . .	(Not done)			
ASSEMBLY				
45. Match fronts & backs.	(Hand)			400
46. Side seam coat. . .	Singer 245-3	L	5	400
47. Raise stitch seams.	Singer 245-3	L	5	400
48. Press seams	N.Y. Pressing Iron, slide arm jumper	U	10	400
49. Baste canvas front & bridle stitch. .	Singer 12W-201	U	10	200
50. Pad lapel	American Blind Stitch #9	L	5	400
51. Shape front	(Hand)			200
52. Trim canvas	(Hand)			400
53. Baste facing to front (first baste)	(Hand)			200
54. Tape front.	Singer 98-45	L	15	200
55. Blind stitch tape	American Blind Stitch #9	L	5	600

See footnotes at end of table.

Table 20. Plant V--Continued

Making department operation	Equipment		Age	Worker's output of topcoats per 8-hour day 2/
	Machine and model	Type drive 1/		
56. Press tape	Jasper Jumper	U	10	600
57. Pipe bottom	Singer 241-2	L	7	600
58. Pull basting from facings	(Hand)			400
59. Baste edges and bottom	American Edge Baster	L	15	400
60. Second baste	Singer Hopper 12W-209	L	8	400
61. Stitch facings and lining	Singer Hopper 12W-211	U	7	400
62. Baste lining	(Hand)			100
63. Blind stitch lining	(Not done)			
64. Fell facings, bottom	Lewis Lockstitch 16-15	L	10	800
65. Mark for buttonholes	(By finishing foreman)			
66. Make buttonholes and	Singer 99W-130	L	10	200
67. Make lapel buttonholes				
68. Tack buttonholes	Singer	L	15	400
69. Join shoulder	Singer 241-2	L	8	400
70. Pair-in sleeves	(Hand)			800
71. Set sleeves	Singer 241-2	L	7	200
72. Press shoulders (armholes)	N.Y. Press Iron G-2	U	7	200
73. Raise stitch armholes	Singer 241-2	L	7	300
74. Armhole baste	(Hand--74 to 78 done as a group)			50
75. Join shoulder lining				
76. Sew armhole & shoulder linings				
77. Tack & trim armholes				
78. Trim collar and neck				

See footnotes at end of table.

Making department operation	Equipment: Machine and model	Equipment: Type drive 1/	Age	Worker's output of topcoats per 8-hour day 2/
79. Set collar to lapels	Singer 241-2	L	7	400
80. Collar baste. . .	(Hand)			100
81. Finishing (Fell collars, shield, shoulders, armholes, cuffs and corners)	(Hand)			17
82. Edgestitch . . .	Singer 241-2	L	7	200
83. Remove bastings .	(Hand)			65
84. Press & form collar	Hoffman TK25	U	7	400
85. Press edges . . .	Hoffman TD9	U	3	200
86. Press sleeves . .	Hoffman VC04	U	5	400
86a. Press body. . . .	Hoffman VC04	U	5	200
87. Mark for button .	(Hand)			400
88. Sew button. (Done with operation 18)				
89. Clean & inspect coat and . . . .)	(Hand)		7)	60
90. Bush (repair))				

1/ G= Group, U = Unit

2/ The worker's output per eight-hour day is the performance as actually reported by the plant. It does not represent the rated capacity of any machine which may be used in the operation.

Table 20. Equipment and worker's output per eight-hour day in the making department of six selected men's topcoat plants, U. S. A., 1951

Plant W*

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 1/
	Machine and model	Age	
PARTS			
1. Line, turn and gauge stitch cuffs	Singer 96-80	12	210
2. Press cuffs	Hoffman	16	3010
3. Canvas make	Singer 107W3	8	200 (In canvas shop)
4. Set lapel to yoke (lining) (included in operation 5) 2/			
5. Face lining pocket and set size ticket and union label. (4,5,&8)	Singer 96-80	13	189
6. Pipe inside pocket slash (6 & 9) . . .	Singer 96-80	8	120
7. Make inside pocket (complete)	(Not done)		
8. Join and bottom hem back lining (Included in operation #5)			
9. Face and set lining to side pockets (2) (Included in operation 6)			
10. Pipe side pockets .	(Not done)		
SLEEVES			
11. Outseam sleeves . .	Singer 96-80	11	510
12. Baste cuffs to sleeves	Singer 55-5	10	210
13. Stitch cuffs . . .	Singer 96-80	11	
14. Join sleeve and lining at cuff ends	Singer 96-80	11	
15. Inseam sleeves . .	Singer 96-80	11	415
16. Press front seams .	Hoffman	16	880
17. Tack lining to sleeves and turn .	(Hand)		135

See footnotes at end of table.

Table 20. Plant W--Continued

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 1/
	Machine and model	Age	
18. Sew buttons at cuffs (Included in operation 88)			
19. Trim sleeve linings	(Not done)		
20 Inspect	(Not done)		
UNDERCOLLAR			
21. Piece undercollar . canvas and	Singer 96-40	20	660
22. Piece undercollar .	Singer 55-5	10	
23. Press seams	Hoffman		450
24. Stitch undercollar	(Not done)		
25. Blind stitch undercollar	American Blind Stitch		700
26. Trim undercollar canvas and	(Hand)		270
27. Collar shaping			
COLLAR			
28. Join collar to undercollar	(28-30 Not done Make open collar)		
29. Trim and turn . . .			
30. Gauge stitch . . .			
FRONTS			
31. Join facings to yoke facing . . .	Singer 96-80	13	168
32. Pipe front facing and yoke	Singer 96-40	12	1120
33. Pipe fronts (Included in operation 38)			
34. Set pockets welts and slash			
35. Pipe pocket openings	(34 to 37)		
36. Set pockets and edgestitch welts	Singer 31-15	15	67
37. Set bellows to facings			
BACKS			
38. Pipe (right) center back (also 33) . . .	Singer 96-80	13	375
39. Pipe left vent . . .			
40. Tape and gauge . . . stitch left vent . .			
41. Sew lining to right vent	(39 to 42) Singer 96-80		
42. Center seam back . . and tack vent			

See footnotes at end of table

Table 20. Plant W--Continued

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 1/
	Machine and model	Age	
43. Press lining (vent)	Hoffman TDO		1117
44. Finish vent lining and hem	Lewis 30-18		1330
ASSEMBLY			
45. Match fronts and backs	(Hand)		1200
46. Side seam coat and	Singer 96-80	13	224
47. Raise stitch seams			
48. Press seams	Hoffman TU-2	12	440
49. Baste canvas front	Singer 12W208	15	182
50. Pad lapel	The New Dearborn	15	320
51. Shape front and	(Hand)		150
52. Trim canvas			
53. Baste facing to front (first baste)	(Hand)		156
54. Tape front	Singer 96-80	13	170
55. Blind stitch tape	The New Dearborn	15	320
56. Press tape	Hoffman TDO	15	620
57. Pipe bottom	Singer 41-12	12	470
58. Pull basting from facings	(Hand)		275
59. Baste edges and bottom	Singer 55-5	10	160
60. Second baste	(Hand)		61
61. Stitch facings and linings	Singer 96-80	10	146
62. Baste lining	(Hand)		176
63. Blind stitch lining	The New Dearborn	15	320
64. Fell facings, bottom and vent	Lewis Lockstitch 17	NA	570
65. Mark and cut for buttonholes	(Hand)		390
66. Make buttonholes)	(Hand)		20
67. Make lapel buttonholes)			
68. Tack buttonholes)			
69. Join and trim shoulder and tape	Singer 96-80	13	450
70. Pair-in-sleeves	(Hand)		1072
71. Sew sleeves	Singer 96-80	NA	86
72. Press shoulders (armholes)	Hoffman VCO-4	NA	425

See footnotes at end of table.

Table 20. Plant W--Continued

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 1/
	Machine and model	Age	
73. Raise stitch armholes	Singer 96-80	na	96
74. Armhole baste (74 and 77)	(Hand)		40
75. Join shoulder lining and			
76. Sew armhole and shoulder linings (Included in operation 81)			
77. Tack and trim armholes (Included in operation 74)			
78. Trim collar and neck	Singer 96-45	na	2030
79. Set collar to lapels	(Hand)		93
80. Collar baste	(Hand)		80
81. Finishing (75, 76, & 81)	(Hand)	34	27
82. Edgestitch	Singer 96-40	na	167
83. Remove bastings	(Hand)		110
84. Press and form collar	4-Hoffman TK2 1-New York NVH	na na	270
85. Press edges, collar, lapels and cuffs	Hoffman 8 TDO 1-H025	na	240
86. Press sleeves and body	5-New York "R" 1-Hoffman B009	na	125
87. Mark for button	(Hand)		345
88. Sew button (88 & 18)	(Hand)		110
89. Clean and inspect coat	(Hand)		150
90. Bush (repair)	(Hand)		(Time work)

* This is an inside shop making a grade 4 topcoat by the progressive bundle system of manufacture. It makes in addition to topcoats, men's overcoats, suits and slacks, as well as women's suits and coats. These products are distributed through its own retail stores. It operates its own sponging, shrinking, and finishing department in addition to the cutting and making departments. This plant is in the 3,000-4,000 total employee size group and output is 600 topcoats a day. All machines in plant have unit drive.

1/ The workers output per eight-hour day is the performance as actually reported by the plant. It does not represent the rated capacity of any machine which may be used in the operation.

2/ Numbers in parentheses indicate other operations included.

na Not available.

Table 20. Equipment and worker's output per eight-hour day in the making department of six selected men's topcoat plants, U.S.A., 1951

Plant X*

Making department operation	Equipment: Machine and model	Equipment: Age	Worker's output of topcoats per 8-hour day 1/
PARTS			
1. Line, turn and gauge stitch cuffs	Singer 245-3	2	160
2. Press cuffs	Hoffman	5	240
3. Baste canvas with bridle (Also 49) 2/	Singer 12W212	3	225
4. Set label to yoke (lining) (Also 8)	Singer 245-3	2	200
5. Face lining pocket (Also 9)	Singer 245-3	2	200
5a. Setting size ticket and union label (Done with 6)			
6. Pipe inside pocket slash .	Singer 245-3	2	185
7. Make inside pocket (complete) (Done with 6) . .			
8. Join and bottom hem back lining (Done with 4) . .			
9. Face and set lining to side pockets (2) (Done with 5)			
10. Pipe side pockets (Done with 6).			
SLEEVES			
11. Sew sleeve linings	Singer 245-3	2	200
11a. Outseam sleeves	Singer 245-3	2	250
12. Baste cuffs to sleeves . .	Singer 12W212	2	240
13. Stitch cuffs on sleeves. .	Singer 245-3	2	200
14. Join sleeve and lining at cuff ends	(Not done)		
15. Inseam sleeves	Singer 245-3	2	350
16. Press seams.	Jumper		280
17. Tack lining to sleeves and turn	Singer 245-3	2	200
17a. Fell sleeve bottoms. . . .	Lewis 16-26	1	200
18. Sew buttons at cuff. . . .	(Not done)		
19. Trim sleeve linings. . . .	(Not done)		
20. Inspect	Visual		90

* Although this plant has the characteristics of an inside shop, it considers itself a contract shop since it manufactures for a single customer. In addition it operates two retail stores. It makes only grade 3 topcoats and overcoats by the bundle system of production. It has a cutting and a making department. This plant is in the 100-150 total employee size group and output is 200 coats a day. All machines have unit drive.
See footnotes at end of table.

Table 20. Plant X--Continued

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 1/
	Machine and model	Age	
UNDERCOLLAR			
21. Piece undercollar canvas .	Singer 245-3	2	1,050
22. Piece undercollar	(Not done)		
23. Press seams	Foot and hand steam iron		2,400
24. Stitch undercollar	Singer 245-3	2	2,400
25. Blind stitch undercollar	American Blind Stitch-Dearborn		265
26. Trim undercollar canvas and	(Hand)		325
27. Collar shaping			
COLLAR			
28. Serging undercollar. . . .	Singer 107W-1		1,200
28a. Join collar to undercollar	Singer 245-3	2	534
29. Trim and turn.	(Hand)		640
30. Baste edge	Singer 24-33	5	400
FRONTS			
31. Join facings to neck piece	Singer 245-3	2	320
32. Pipe front facing and neck piece (37).	Singer 245-3	2	200
33. Pipe fronts and backs (Also 38 and 39)	Singer 245-3	2	200
34. Set pocket welts and slash	Singer 245-3	2	80
35. Pipe pocket openings . . .	(Not done)		
36. Make and stitch around bellows.	Singer 245-3	2	250
37. Set bellows to facings (Included in 32)			
BACKS			
38. Pipe (right) center back and			
39. Pipe left vent (Done with 33)			
40. Tape and gauge stitch left vent.			
41. Sew lining to right vent .	Singer 245-3	2	150
42. Center seam back and tack vent.			
43. Press lining (vent). . . .	Hoffman (done by sleeve presser)		400
44. Finish vent lining and hem	(Not done)		

See footnotes at end of table.

Table 20. Plant X--Continued

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 1/
	Machine and model	Age	
ASSEMBLY			
45. Match fronts and backs	Floor girl (indirect)		
46. Side seam coat and			
47. Raise stitch seams	Singer 245-3	2	110
48. Press seams	(Not done)		
49. Baste canvas front (Included in 3).			
50. Pad lapel	American Blind Stitch-Dearborn Model 12PL	4	300
51. Shape front and			
52. Trim canvas.	Hand shears		125
53. Baste facing to front (first baste).	Singer 12W212		200
54. Tape front	Singer 96-45	15	125
55. Blind stitch tape.	American Blind Stitch-Dearborn		400
55a. Baste fly-front edges.	Singer 55-5	5	450
55b. Stitch fly-front edges	Singer 245-3	2	400
56. Press tape	Hand steam iron		265
57. Pipe bottom	Singer 245-312PL	1	400
57a. Tape Gauges.	Singer 245-3	2	400
58. Pull basting from facing	(Hand)		640
58a. Trim corners and turn inside out	(Hand)		400
59. Baste edges and bottom	Singer 55-5	5	150
60. Second baste	Singer 12W212	5	200
61. Tack facings and lining.	American Blind Stitch Dearborn	4	525
62. Baste lining	Singer 12W212	5	200
63. Fell bottom	Singer 17-10		260
64. Fell vent and pocket bellow	Lewis 30-22	2	640
64a. Fell facings	Lewis 16-34	4	400
65. Mark for buttonholes and	Reece buttonhole machine		
66. Make and tack buttonholes.	Singer 68-38	10	225
67. Mark, make and tack lapel buttonhole	Reece buttonhole machine Singer 68-38	10	535
68. Tack buttonholes (included in 66).			

See footnotes at end of table.

Table 20. Plant X—Continued

Making department operation	Equipment: Machine and model	Equipment: Age	Worker's output of topcoats per 8-hour day 1/
69. Join and trim shoulder and tape	Singer 245-3		265
69a. Close fly front.	Singer 12W212	5	450
69b. Top-stitch fly front . . .	Singer 245-3	2	450
70. Pair-in sleeves.	Hand (used as fill in operation)		800
71. Set sleeves	Singer 245-3	3	100
72. Press shoulders (armholes)	Foot and hand steam iron		
73. Raise stitch armholes. . .	Singer 51W51	1	200
74. Armhole baste and			
75. Join shoulder lining . . .	Singer 12W213	12	200
76. Sew armhole and shoulder linings	(Hand)		35
77. Tack and trim armholes . .	Singer 111W117	12	200
78. Trim collar and neck . . .	(Hand)		640
79. Set collar to lapels and			
80. Collar baste	(Hand)		200
81. Finishing, shoulders, 4 corners of bottom, undercollar, bottom and sides	(Hand)		35
82. Edgestitch	Singer 241-12	1	200
83. Remove bastings.	(Hand)		80
84. Form collar.	(Hand)		100
84a. Press collar	Hoffman	2	250
85. Press edges, collar. . . .	Hoffman		225
86. Press lapels, sleeves. . .	Hoffman		250
86a. Press body	Hoffman		140
86b. Finish pressing and remove shine	Hoffman		200
87. Mark for button and			
88. Sew button and tack flyfront and vent and put in lining. . . .	(Hand)		95
89. Clean and inspect coat . .	(Hand)		225
90. Bush (repair).	(Part time as required)		

1/ The worker's output per 8-hour day is the performance as actually reported by the plant. It does not represent the rated capacity of any machine which may be used in the operation.

2/ Numbers in parentheses indicate other operations included.

Table 20. Equipment and worker's output per eight-hour day in the making department of six selected men's topcoat plants, U. S. A., 1951

Plant Y*

Making department operation	Equipment: Machine and model	Equipment: Age	Worker's output of topcoats per 8-hour day 1/
PARTS			
1. Line, turn and gauge stitch cuffs	(Not done)		
2. Press cuffs.	Hoffman	15	1,600
3. Canvas make.	(Not done)		
4. Set label to yoke (lining) .	Singer 19-18	15	520
5. Face lining pocket, set size ticket (Also 7, 9 and 34) 2/.	Singer 96-10	20	70
6. Pipe inside pocket slash (Also 10, 32, 33, 38, 39, 57).	Singer 96-10	20	130
7. Make inside pocket (complete) (done in 5)			
8. Join and bottom hem back lining (Also 41 and 42). .	Singer 96-10	20	130
9. Face and set lining to (2) side pockets (Done in 5)			
10. Pipe side pockets (Done in 6)			
SLEEVES			
11. Sew up sleeve linings (Also 13, 14, 44, and 64) and. .	Singer 96-10	20	260
11a. Outseam sleeves.	Singer 96-10	20	80
12. Baste cuffs to sleeves . . .	(Hand)		
13. Stitch cuffs (Done in 11). .			
14. Join sleeve and lining at cuff ends (Done in 11).			
15. Inseam sleeves (with 71) . .	Singer 241-3	5	130
16. Press seams.	Hoffman	50	160
17. Tack lining to sleeves and turn	Singer 96-10	20	130
18. Sew buttons at cuffs	(Not done)		
19. Trim sleeve linings.	(Not done)		
20. Inspect	(Not done)		

* It is an inside shop making only grade 4 topcoats and overcoats, by the bundle system of production. It has a cutting and a making department. This plant is in the 75-100 total employee size group and output is 130 coats a day. All machines have unit drive.

See footnotes at end of table.

Table 20. Plant Y--Continued

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 1/
	Machine and model	Age	
UNDERCOLLAR			
21. Piece undercollar canvas (Also 22, 24 and 25) . .	American Blind Stitch	20	130
22. Piece undercollar (Done in 21)			
23. Press seams (Done in 2). .	Hoffman		
24. Stitch undercollar and			
25. Blind stitch undercollar (Done in 21).			
26. Trim undercollar canvas. .	(Not done)		
27. Make collar (Also 49). . .	Lewis	20	260
27a. Collar shaping and baste yoke	(Hand)		260
COLLAR			
28. Join collar to undercollar)			
29. Trim and turn. . . . . . .)	(Hand)		130
30. Gauge stitch . . . .)			
FRONTS			
31. Join facings to yoke facing	(Not done)		
32. Pipe front facings and yoke (done in 6) and			
33. Pipe fronts			
34. Set pocket welts and slash (done in 5). . . .			
35. Pipe pocket openings . . .	(Not done)		
36. Set pockets and edge-stitch welts	(Not done)		
37. Set bellows to facings (Done in 63)			
BACKS			
38. Pipe (right) center back (Done in 6) and			
39. Pipe left vent			
40. Tape coat (Also 54 and 73)	Singer 96-45	20	200
41. Sew lining to right vent and			
42. Center seam back and tack vent (Done in 8)	Singer 96-10	20	130
43. Press lining (vent) (Done in 86)			
44. Finish vent lining and hem (Done in 11)			

See footnotes at end of table.

Table 20. Plant Y--Continued

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 1/
	Machine and model	Age	
ASSEMBLY			
45. Match fronts and backs	(Considered indirect labor)		
46. Side seam coat and	Singer 96-10	20	70
47. Raise stitch seams			
48. Press seams (Done in 2)			
49. Baste canvas front (Done in 27)	Singer 12W212	6	260
50. Pad lapel (Also 55)	U. S. Blind Stitch #90	20	160
51. Shape front	(Hand)		130
52. Trim canvas	(Hand)		345
53. Baste facing to front (First baste)	(Hand)		25
54. Tape front (Done in 40)			
55. Blind stitch tape (Done in 50)			
56. Press tape	Price Steam Iron	20	260
57. Pipe bottom (Done in 6)			
58. Pull basting from facings (Done in 83)			
59. Baste edges and bottom	(Not done)		
60. Second baste	(Not done)		
61. Stitch facings and lining	Singer 96-10	20	130
62. Baste lining	(Hand)		
63. Fell bottom and)			
64. Fell facings, bottom and vent (Done with 11))	(Hand)		15
65. Mark for buttonholes and vent	(Hand)		345
66. Make buttonholes, trim collars and mark and open flys)	(Hand)		30
67. Make lapel buttonhole)			
68. Tack buttonholes)			
69. Join and trim shoulder and tape	Singer 96-10	20	345
70. Pair in sleeves	(Hand)		1,000
71. Set sleeves (with 15)	Singer 241-3	5	130
72. Press shoulders (armholes)	Hoffman	15	130
73. Raise stitch armholes (with 40)	Singer 96-10	20	400

See footnotes at end of table.

Table 20. Plant Y--Continued

Making department operation	Equipment		Worker's output of topcoats per 8-hour day 1/
	Machine and model	Age	
74. Armhole baste	(Hand)		130
75. Join shoulder lining	(Hand)		
76. Sew armhole and shoulder linings			
77. Tack and trim armholes			
78. Trim collar and neck	(Not done)		
79. Set collar to lapels and			
80. Collar baste	(Hand)		
81. Finishing	(Hand)		16
82. Edgestitch	Singer 96-10	20	130
83. Remove bastings (Also 58).	(Hand)		175
84. Press and form collar	Hoffman	8	130
85. Press edges and	Hoffman	15	50
86. Press and sponge body (Also 43)			
87. Mark for button (Also 89).	(Hand)		130
88. Sew button	(Hand)		75
89. Clean and inspect coat (Done with 87)			
90. Bush (repair).	(Not done)		

1/ The worker's output per 8-hour day is the performance as actually reported by the plant. It does not represent the rated capacity of any machine which may be used in the operation.

2/ Numbers in parentheses indicate other operations included.

Table 20. Equipment and worker's output per eight-hour day in the making department of six selected men's topcoat plants, U.S.A., 1951

Plant Z *

Making department operation	Equipment	Worker's output of topcoats per 8-hour day 1/
	Machine and model	
1. Fitter	Hand shears	200
2. Tape gores	Singer	600
3. Pipe backs	Singer (with benders)	240
4. Pipe fronts	Singer (with benders)	240
5. Tape front armhole	Singer	400
6. Sew vent lining.	Singer knife machine	600
7. Raise vent lining and stitch down double	Singer	600
8. Press vent lining.	Hoffman	600
9. Mark back vent and		
10. Trim vent lining	(Hand)	600
11. Join backs	Singer	300
12. Press tape vent.	Hoffman	600
13. Raise backs.	Singer	300
14. Baste lining vent.	Hopper	600
15. Sew lining to silesia.	Singer	300
16. Cash pocket, sew around silesia	Singer	600
17. Sew patch to silesia	Singer knife machine	600
18. Pipe bellow patch.	Singer (with benders)	600
19. Press pocket patch	Hoffman	600
20. Stitch down silesia to patch	Singer	600
21. Make and stitch welt complete	Singer knife machine	200
22. Trim and turn welt	(Hand)	600
23. Press welt	Hoffman	600
24. Mark and match slash welts	(Hand)	300
25. Set welts.	Singer	170

* It is an inside shop making a grade 4 topcoat in addition to men's suits, slacks, and sport coats, by a section lot system of production in conjunction with a modified line system with 12 machines per line. It operates its own sponging, shrinking and finishing department, in conjunction with its cutting and making departments. This company operates several plants and distributes its output through dealer franchise agreements. This plant is in the 2,000 to 3,000 total employee size group and output is 600 topcoats a day. All machines are group-driven and average four years of age.

The operational information listed differs from the standard list used for the other plants in this study. It was devised by the Company to reflect its own standards.

See footnotes at end of table.

Table 20. Plant Z--Continued

Making department operation	Equipment Machine and model	Worker's output of topcoats per 8-hour day 1/
26. Cut pocket and stitch down piping twice. . .	Singer	300
27. Trim pocket and match bellows.	(Hand)	300
28. Attach bellows and tack welt complete.	Singer	170
29. Press pocket	Hoffman	600
30. Trim backs before joining.	(Hand)	600
31. Match back and front . .	(Hand)	600
32. Join side seams.	Singer	300
33. Raise side seams	Singer	300
34. Press three seams. . . .	Hoffman	400
35. Tape back.	Union Special	400
36. Press tape on armhole. .	Hoffman blade	600
37. Make yokes	(Hand)	300
38. Press yokes.	Hoffman jumper	600
39. Sew label on yoke. . . .	Singer	600
40. Match yokes.	(Hand)	600
41. Baste yokes.	(Hand)	200
42. Match canvas and mark lapel	(Hand)	600
43. Baste canvas and shoulder pads and baste bellows patch.	Boshe Hopper	150
44. Baste bridle	Union Special	600
45. Pad lapel and tack pockets.	American Blind Stitch	240
46. Tack bellows patch to canvas with lapel machine.	American Blind Stitch	600
47. Press bridle and front .	(Hand)	300
48. Rebaste canvas	Boshe Hopper	480
49. Repress front.	Hoffman	600
50. Shape front.	Hand shears	150
51. Trim canvas front. . . .	Hand shears	400
52. Pipe bottom.	Singer (with benders)	480
53. Sponge facing first time	Hoffman	600
54. Piece pocket and sew union label.	Singer	400
55. Join lining and facing .	Singer	300

See footnote at end of table.

Table 20. Plant Z--Continued

Making department operation	Equipment	Worker's output of topcoats per 8-hour day 1/
	Machine and model	
56. Set pocket	Singer	400
57. Sew label	Singer (cross stitch)	600
58. Finish inside pocket	Singer	400
59. Trim facing	Hand shears	600
60. Sew bellows to facing	Singer	400
61. Stitch down bellows to facing	Singer	400
62. Press lining	Hoffman jumper	600
63. Sew piece pocket	Singer	600
64. Match lining to coat	(Hand)	600
65. Baste shape	(Hand)	120
66. Tape sewing	Singer knife machine	170
67. Tape felling	Singer blind stitch	480
68. Press tape flat	Hoffman	600
69. Pull basting	(Hand)	600
70. Trim and turn edge	(Hand)	400
71. Press edge open	Hoffman jumper	400
72. Sew fly lining	Singer	300
73. Stitch fly edge	Singer	600
74. Press open fly	Hoffman jumper	600
75. Baste edge all around	Baste - chain stitch singer	200
76. Baste points by machine	Singer	600
77. Baste fly lining	Singer hopper	600
78. Tack and mark fly	(Hand)	400
79. Stitch fly after marking	Singer	600
80. Baste lapel on hopper	Singer	480
81. Trim canvas before second basting	(Hand)	400
82. Second facing basting and		
83. Baste below facing	Singer hopper	300
84. Tack facing	American Blind Stitch	600
85. Fell back vent	Lewis Special felling machine	600
86. Lining basting	(Hand)	150
87. Fell vent lining	Lewis felling machine	600
88. Fell bottom	Lewis felling machine	600
89. Fell bellows	Lewis felling machine	300
90. Join shoulders	Singer	600
91. Press shoulders and canvas	Hoffman jumper	600
92. Raise shoulders	Singer	600
93. Undercollar seam stitch to canvas	Singer	600
94. Press undercollar seam	Hoffman jumper	600
95. Mark undercollar stand	Hand (see 97-98-99)	

See footnote at end of table.

Table 20. Plant Z --Continued

Making department operation	Equipment	Worker's output of topcoats per 8-hour day 1/
	Machine and model	
96. Baste undercollar on canvas	Baste chain stitch	600
97. Trim undercollar	(Hand, including mark and press)	150
98. Pad undercollar		
99. Check undercollar		
100. Match undercollar to coat	(Hand)	1,200
101. Shoulder and undercollar baste-mark neck	(Hand)	150
102. Tack undercollar	(Hand)	125
103. Tack inside neck	American Blind Stitch	600
104. Undercollar shape press	Hoffman	300
105. Shape undercollar	Hand shears	300
106. Seam piece topcollar	Singer	600
107. Match topcollar to coat	(Hand)	1,200
108. Press seam of topcollar	Hoffman Jumper	600
109. Prepare collar for topcollar basting	(Hand)	300
110. Baste topcollar complete	(Hand)	37
111. Draw seams	(Hand)	125
112. Fell collars and make 4 corners	(Hand)	75
113. Pull basting bottom	(Hand)	600
114. Press edge first time	Hoffman	300
115. Stitch edge and sew hanger	Singer	170
116. Make sleeve lining	Singer	400
117. Join outseam of sleeve	Singer	400
118. Press outseam of sleeve	Hoffman jumper	600
119. Raise outside seam	Singer	400
120. Press outseam	Hoffman	600
121. Tack wiggan	Singer	400
122. Sew round cuffs	Singer	600
123. Trim and turn cuffs	(Hand)	600
124. Baste cuff edge	Singer	600
125. Stitch around cuffs	Singer	600
126. Press cuffs	Hoffman	600
127. Mark and match cuffs	(Hand)	600
128. Pull basting and notch lining	(Hand)	1,200
129. Pull baste on the mark, bottom of cuff	Hopper	600
130. Close cuff	Singer	600
131. Press cuff seam	Hoffman jumper	600
132. Tack cuff in sleeve on the mark	Singer	400

See footnote at end of table.

Table 20. Plant Z--Continued

Making department operation	Equipment Machine and model	Worker's output of topcoats per 8-hour day 1/
133. Sew inseam of sleeve. .	Singer	400
134. Turn sleeve first time.	(Hand)	600
135. Turn sleeve inside and out twice	(Hand)	600
136. Baste cuff on sleeve. .	Hopper	400
137. Tack cuff lining to sleeve.	Singer	400
138. Baste around cuff 1st time	Bushing machine	600
139. Baste bottom of sleeve cuff	Chain stitch machine	600
140. Tack corner cuff. . . .	(Hand)	300
141. Tack sleeve lining inseam	Singer	600
142. Tack sleeve bottom. . .	American Blind Stitch	600
143. Tack lining	American Blind Stitch	600
144. Baste bottom on sleeve lining.	(Hand)	200
145. Press cuff all around .	Hoffman	400
146. Blade pressing.	Hoffman	600
147. Match sleeve to coat. .	(Hand)	600
148. Set in sleeve	Singer	125
149. Under press armhole . .	Hoffman jumper	200
150. Raise armhole	Singer	200
151. Prepare armhole and baste shoulders . . .	(Hand)	150
152. Baste armhole	(Hand)	60
153. Mark and cut buttonhole	Machine	600
154. Make buttonhole by machine (at times). .	Reece	400
155. Make buttonhole on lapel	(Hand)	100
156. Black felling	(Hand)	27
157. White felling (armholes and cuffs). . .	(Hand)	20
158. Tack buttonhole	(Hand)	200
159. Pull basting	(Hand)	60
160. Black thread cleaning .	(Hand)	86
161. Clean and tack fly. . .	(Hand)	300
162. Make corner on bellows patch . . . .)	(Hand)	60
163. Busheling and examining)		
164. Second edge pressing. .	Hoffman	240
165. Sponging inside facing second time	Hoffman	600

See footnotes at end of table.

Table 20. Plant Z --Continued

Making department operation	Equipment	Worker's output of topcoats per 8-hour day 1/
	Machine and model	
166. Press collar.	Hoffman	240
167. Press sleeve elbow. . .	Hoffman	600
168. Press chest	Hoffman	300
169. Press body and sleeve .	Hoffman	170
170. Blocking sleeve	Hoffman	240
171. Sponging collars. . . .	Hoffman	600
172. Press lapel	Hoffman	300
173. Mark buttons	(Hand)	600
174. Match buttons and size ticket.	(Hand)	600
175. Sew buttons including sleeve and size ticket	(Hand)	150
176. Hand pressing	Gas iron	40
177. Touch up coat by hand .		40
178. Final examination and clean spots	(Hand)	67
180. General tailoring and busheling	(Hand)	
181. Press shoulder.	Hoffman	300
182. Grease armhole and block	Hoffman	125

1/ The worker's output per 8-hour day is the performance as actually reported by the plant. It does not represent the rated capacity of any machine which may be used in the operation.

Case Study Data on
Productivity and Factory Performance

MEN'S WINTER SUITS AND TOPCOATS

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CHAPTER IV: TECHNICAL DATA

History

With few exceptions, sewing of wearing apparel was accomplished entirely in the home in the United States until 1860 when demands for large quantities of uniforms during the Civil War led to the beginning of factory production of clothing. The development of the chain stitch sewing machine after 1825 and the lock stitch machine, by Elias Howe in 1846, were the first steps toward displacing hand stitching with machine sewing. These first machines were powered by hand crank or foot treadle, and attained a speed of 800 to 900 stitches per minute by 1875. With the introduction of steam power the speed was increased to 1,500 stitches per minute. By 1900 many improvements had been made in the sewing machine, such as buttonhole attachments, button-sewing, and pocket-making machines. Efficient machines were perfected with a capacity of 4,000 stitches per minute. Today machines attain a speed of 5,000 stitches per minute.

About 1872 power cutters were invented which enabled workers to cut several dozen layers of cloth at one time. The first electrically operated cutting machines were stationary and cutting was performed by bringing the fabric to the machines. Substantial improvements made in electric motors some 20 years later resulted in the introduction of portable rotary electric knives. The electric cutting machine was perfected in 1924 to cut 240 thicknesses of cloth, if desired.

The pressing operation was the last to benefit by innovations in mechanization. By the turn of the century gas-air hand irons were replacing hand irons heated by charcoal or stoves. About 1900 the steam pressing machine was introduced for finished and off-pressing but did not replace gas irons perceptibly for 10 years.

From World War I until 1930 few major improvements were made in the machinery used by clothing manufacturers, but during the following 10 years several technological changes took place. Attachments for sewing machines were introduced which performed special tasks. Transmission machinery was improved, thereby decreasing starting and stopping time of sewing machines. Mechanical spreading machines were introduced which enabled producers to spread many plys of cloth quickly and efficiently.

General Information

Of a total of 452 industries surveyed in the United States, the men's and boys' suit and coat industry ranks 21st in value of output and 435th in concentration of output based on the production of the four

Table 21. Geographical distribution of establishments producing men's and boys' suits and coats, and value of product shipped, 1947

Region (or state)	Number of establishments	Percent of total	Value of products shipped (000's)	Percent of total
All establishments	1,816	100.0	$1,411,575	100.0
New England	131	7.2	76,037	5.4
Middle Atlantic	1,139	62.7	867,857	61.5
New York	843	46.4	584,640	41.4
North Central	255	14.1	257,659	18.3
South	194	10.7	181,414	12.8
Mountain and Pacific . .	97	5.3	28,608	2.0

Source; U. S. Department of Commerce, Bureau of Census, Census of Manufactures, 1947.

Table 22. Production (cuttings) of men's clothing in the United States, 1947-1950

Product	(thousands of units)			
	1950	1949	1948	1947
Winter suits	19,110	15,566	19,103	21,732
Overcoats and topcoats	6,550	5,548	6,194	7,233
Pants	(1/)	(1/)	(1/)	23,923

1/ Not available.

Source: U. S. Department of Commerce, Bureau of Census, Facts for Industry, Series M67B.

Table 23. Labor and other costs of business in the Men's and Boys' Suit and Coat Industry, 1947

Type of cost	Amount (000's)	Percent of total
Total cost (labor, materials, etc.)	$1,142,883	100.0
Materials, parts, containers, supplies	559,058	48.9
Labor	396,244	34.7
Contract and commission work	183,727	16.1
Purchased electric energy	2,436	.2
Fuels	1,418	.1

Source: U. S. Department of Commerce, Bureau of Census, Census of Manufactures, 1947.

Table 24. Distribution of establishments by size and employment for men's and boys' suits and coats, 1947

Employees	Number of establishments	Percent of total	Employment	Percent of total
All establishments . . .	1,816	100.0	146,768	100.0
Less than 50	1,193	65.7	16,218	11.0
50 - 99	262	14.4	18,614	12.7
100 - 249	235	12.9	35,465	24.2
250 - 499	81	4.5	29,211	19.9
500 - 999	30	1.7	19,549	13.3
1000 and over	15	.8	27,711	18.9

Source: U. S. Department of Commerce, Bureau of Census, Census of Manufactures, 1947.

largest companies. In 1947 the four largest companies produced only 8.8 percent of the industry's total output. However, in 1947 New York City produced 8,792,000 men's suits or 35 percent of the total unit output of the United States. (Tables 21,22, 23, 24, and 25)

Table 25. Men's and students' wool suit production centers, 1947

City	Thousands of suits cut
New York	8,972
Philadelphia . . .	3,648
Baltimore	2,138
Rochester	1,601
Chicago	1,520
Cleveland	1,261
Boston	782
Cincinnati	668
St. Louis	436

Source: U. S. Department of Commerce, Bureau of Census, Facts for Industry, Series M67B-07.

The Manufacturing Process

Selection of Materials. Before the manufacturing process can begin, the selection and purchase of piece goods must be made from the textile mill. The cloth buyer must keep in mind the right piece goods for his particular plant and market. Such elements as plant facilities, customer interest and desire, color trends, regional location of market, and grade of garment to be manufactured are some of the determining factors in the selection of piece goods. Selection of cloth are made from "swatches", 2 x 3 inch clips of the fabric, or from a blanket which contains a range of patterns in one continuous piece. The cloth buyer must make selections from rough and smooth materials, and from plaid, striped, and checked fabrics. In addition, the buyer must strike a color balance which is in harmony with the prevailing fashion.

Designing Department. The actual production of a garment starts when the designer begins his work. The designer must be thoroughly versed in the principles of styling. He must exhibit creative skill and individuality in the finished product for his efforts are directed primarily toward the development of patterns which will provide distinctive drape and styling as well as comfortable fit for most of the basic masculine body types. A complete knowledge of the quality of fabrics and trimmings is also essential to the designer's work.

The master pattern for the approved model is sent to the grading room where patterns for all sizes are made according to the standard dimensions established for the basic body types. The complexity of the pattern grading operation varies from company to company. In general, patterns are developed for a range of sizes, for regular, long, and short.

Sponging, Shrinking, and Finishing Department

Bolts of cloth from the mills are processed through a company's sponging, shrinking, and finishing department, or they may be sent to a contracting firm which specializes in this process.

The sponging, shrinking, and finishing operations vary greatly from company to company, depending on the quality of the end product desired. Of the various methods in use in the United States, cold water shrinking appears to be the preferred method for most types of fabric. The following description outlines the major steps in the cold water shrinking process.

1. Each bolt of cloth is tested for tensile strength and fading, and is examined and weighed to determine whether it conforms to the specifications of the material ordered.

2. The best shrinking and finishing process is then determined by experimenting with a sample of the fabric.

3. Bolts of similar cloth may be sewed end to end in order to facilitate continuous processing.

4. Softening the cloth is next accomplished by movement of the fabric over steam troughs.

5. It is at this point that the cloth undergoes immersion in cold water through the operation of equipment set up for this purpose. The water is then squeezed out by a set of rollers or removed by suction.

6. The cloth moves to a drying machine, and the shrinking process has now been completed. The time element, the amount of heat applied, and precise shrinking specifications can be set in actual performance. The usual shrinkage requested is approximately 5 percent for worsteds and 7 percent for gabardines.

When the shrinking operation is completed, the fabric is pressed between heated rollers in order to remove wrinkles arising from the shrinking process and to correct simultaneously any distortion which may have occurred in the right angle relationship of the fabric. Bold checks or plaids must be realigned to insure accurate matching of the pattern. This can be accomplished either by carefully rolling the cloth and checking the alignment as it is rolled or by folding the cloth on the double and tying the edges at frequent intervals. The sponging, shrinking, and finishing operation not only improves the appearance of the fabric but also facilitates the manufacturing process. The extent and expense of this process is closely related to the grade of garment the manufacturer produces.

The operation and machinery used in the shrinking and finishing process vary from company to company. Much of the equipment is custom built for the clothing manufacturer. Some processes use a steam cylinder upon which the cloth is wound and steamed. If this process is performed under vacuum, it is called "decatizing."

Cutting Department

Cloth is requisitioned from the stock room according to the production specifications on the cutting ticket. The cloth is usually spread by a hand-operated spreading machine or by hand. The worker (spreader) spreads multiple layers of cloth smoothly and evenly on a cutting table. The usual practice is to lay suiting or topcoat material on the open in long lays from which garments of several sizes will be cut. When the piece goods are laid on the open, great care must be exercised in shading; plaids and checks are often laid on the double. When the end of a bolt is reached the spreader overlaps the cloth from the next bolt far enough back so that no garment part will be ruined when the cutting is done. The number of layers (plys) is closely related to the quality of the garment produced and a complete lay varies from one to forty plys for suits or topcoats.

The pattern is arranged on a lay in such a manner as to minimize waste and to match designs. The designs in the many parts should match perfectly when assembled, especially back seams and pockets. After the patterns have been arranged, their outlines are traced with a special type of chalk. Perforated patterns may be used in the marking operation. The perforated pattern is made from a special piece of paper the same dimensions as those of the lay. The patterns are laid on the paper and their outlines marked with a tracing wheel that cuts perforations in the paper. The paper may be used several times since the outline on the cloth is made by dusting powder over the perforations.

The cloth is now ready to be cut. Cutting is usually done by round or straight portable hand knives. The cutter follows the pattern lines carefully. If the lay is several plys high, the cloth may be held in place by weights until the cutting operation is completed.

The laying up, marking in, and cutting may be performed either by one worker for all operations, or by an individual worker for each operation, or by teams.

The marks made from the patterns or templates are used as guides to make small cuts, holes, and thread markings in the garment parts. These markings facilitate assembly and fix the location of pockets, buttons, and buttonholes. Small cut parts of suiting and lining may be trimmed before assembly into bundles which consist of garment pieces and accessories. Bundle tickets are attached to identify the parts as well as to locate piece work. At this point the bundles are ready for the first sewing operation.

Making Department

Bundles of parts are sent from the cutting room to the sewing or making department where the parts are joined to produce the finished garment. Making operations for men's suits are divided among three shops which produce sack coats, pants, and vests. There is only one making department in a topcoat plant. Small parts such as collars, sleeves, and flys are made first in many specialized operations. In the final assembly these small parts are joined to the larger parts of the garment. The amount of machine work performed on each garment depends upon the quality of the garment. Much of the work done with special sewing machines on the lower grade garment is done by hand on the higher quality garment. For example, the parts of the higher grade product are joined by hand-basting prior to permanent stitching. Hand-sewing yields a garment which is superior in fit and drape.

The amount of under-pressing which is performed on the garment during the making process also varies with the quality. In the fabrication of better garments, under-pressing is performed after the completion of each seam joining operation such as gores, pockets, collar, and tape sleeve lining. Under-pressing shapes and smooths the parts, thus facilitating final assembly and pressing, as well as improving the appearance of the finished garment. The final pressing includes the pressing of collars, edges, and fronts.

The number of operations into which the work is divided, i.e., the number of hands through which work passes, depends upon the production method used and the capacity desired by management. In this survey, for example, in manufacturing men's suits the number of operations into which the making department is divided ranges from 62 to 153 for sack coats and 25 to 62 for pants.

Bundle System. Making operations are performed by one or a combination of several basic methods The predominant ones used in the United States are the bundle and progressive bundle or sectional systems. Under the bundle system, work is moved through the making department in bundles of 5 to 60 pieces depending upon the quality of the garment being produced and the manufacturing practice of the plant, i.e., whether the plant produces for stock or to order.

The bundle constitutes the unit of work and retains its identity throughout the making operations until the final assembly and pressing of the garment. Each worker performs one or more specific tasks on the parts in the bundle. Sewing machines are not necessarily arranged in order of the work flow because of the limitations imposed by the use of centrally powered or line drive machines.

Several means are employed to distribute the bundles among workers The worker may be required to go to a central location to pick up the bundle; he may receive the bundle from the person or persons who precede him in the sequence of operations; or have it brought to him by a "bundle boy" or "floor boy."

The bundle system usually requires more handling of materials than any other system of production. In addition to the time required in moving the bundles from temporary storage to the operator, time is consumed in taking each part out of the bundle, positioning the parts for work, and remaking the bundle when the specific task is completed. Some plants have decreased this time by using specially designed racks or stackers which permit certain tasks to be performed on the garment without untying the bundle.

The system, however, has the decided advantage of flexibility when a variety of types and styles of garments are made. The system can be adjusted easily to new production patterns. Temporary shortages of materials or absenteeism of workers have little effect upon the efficiency of operations. Workers are completely independent of each other and tend to work as rapidly as is physically possible under an incentive pay system. Operators are not limited in output by the slowness of those preceding them in the operational setup.

Line System. The line system, used more extensively in other apparel industries, is used infrequently in the men's clothing industry, usually in plants which make one product or specialize in a limited number of models. This system substitutes a single garment for the bundle as the unit of work. Workers and sewing machines are arranged in groups of three to four in accordance with a logical sequence of operations, the unit of work being moved along troughs or chutes from one work station to the next. Individually powered machines must be employed under this system.

Making operations are broken down into more numerous tasks in the line system than in other systems. This high degree of job specialization decreases the amount of time required to train inexperienced workers. Handling time of individual workers and between workers is also reduced to a minimum. However, achieving precise balance on the line has proved to be a serious disadvantage in this system. A study must be made of the time requirements for each of the individual operations, and provisions must be made for a sufficient number of workers and machines at each operation to balance the time requirements for all other operators in the sequence. Inefficient workers cause bottlenecks and limit the output of other workers. Absence of one or more of the workers on the line, or a temporary shortage of materials will also upset the balance of the line, causing periods of idleness. Some plants retain some all-around operators who are able to perform any sewing operation and who may substitute for absent or slow workers.

Progressive Bundle System. The sectional or progressive bundle system of production combines the principles of the bundle and line methods. The unit of work is still the bundle, but operators are grouped according to the section of the garment upon which they work. Each worker performs one or two assigned tasks on the parts in the bundle, which is then routed to the next worker in the section. For example, a group or section of operators may (1) join front seam of sleeve and tack, (2) sew sleeve vent, (3) join elbow seam of sleeve, (4) baste sleeve vent and tack turn-up, (5) notch and tack sleeve vent, and (6) press sleeve seams.

This system reduces handling time between operators, and is fairly flexible. However, the worker is still required to withdraw parts from the bundle, position them at the machine or perform the operation by hand, and then replace them in the bundle. Operators must rely upon the completion of the work preceding their assigned tasks. In this system, too, the problem of balancing the operations to provide a steady, smooth flow of work from operator to operator is also present to a limited extent.

In the United States, many combinations of the production methods mentioned above are used in the manufacture of men's clothing. Few plants use exactly the same system. Many have layouts which are an outgrowth of the spasmodic expansion of loftshops, i.e., plants occupying one or more floors of a multistoried building. Plants may employ a combination of systems as a result of the type of garment being produced or the manufacturing practices inherent in the plant.

Table 26 describes operations and grades of workmanship based on the machine or hand construction of the sack coat. The grade of workmanship is basically determined by the amount of hand work performed.

Table 26. Description of operations and workmanship in the construction of men's sack coats, grades 1,2,3,and 4

Name of operation	Description of operation	Operation performed by 1/			
		Grade 1	Grade 2	Grade 3	Grade 4
Fitting	Adjust the sizes of linings to equal outer shell	H	H	H	H
Tickets	Open bundle, attach tickets to all sleeves in pairs, all linings, all outsides to identify and to provide work record of each operator	M	M	M	M
Dart sewing	Joining underarm and front gores	M	M	M	M
Pockets complete, beeson 2/ tacked welt	Making silesia pocket, attaching pocket to coat, tacking welt or cloth portion around pocket with additional stitching so it will withstand strain	M	M	M	M
Piping seams, bottoms	Sewing bias strips cut from lining material or prepared strips of matching shade to bottom of side seams, center back seams and bottom of back	M	M	M	M
Serging seams, bottoms	Stitching bottom of forepart of coat, to which lining is sewn, with an overcast stitch	-	-	M	M
Joining seams, taping armholes, sew around pocket	Side and center seams sewn, joining foreparts and back of coat; tape is sewn around inside of armhole with as narrow a seam as the fabric will permit; sewing all around pocket opening attaching silesia pocket firmly in garment	M	M	M	M
Sew tape in gorge	Tape sewn to collar seam	M	M	M	M
Making shields	Underarm shields - part of lining	-	-	M	M
Piecing undercollar	Joining the two halves of the undercollar	M	M	M	M
Lining making, piped pockets and yokes	Joining the underarm and front gores of the lining, joining upper and under portion of yoke or neck block	M	M	M	M
Sleeve making	Joining top sleeve on under sleeve and tacking buckram	M	M	M	M
Sleeve lining sewing	Joining top sleeve lining and under sleeve lining	M	M	M	M

See footnotes at end of table.

Table 26. Description of operations and workmanship in the construction of men's sack coats, grades 1,2,3,and 4 - Con.

Name of operation	Description of operation	Operation performed by 1/ Grade 1	Grade 2	Grade 3	Grade 4
Sleeve lining tacking	Joining the sleeve lining to the sleeves at the seams	M	M	M	M
Lapel padding	Stitching to give shape and roll to lapel	M	M	M	M
Collar padding	Stitching under collar to give shape	M	M	M	M
Tape filling	Sewing the inner edge of tape in front edge to canvas front	-	M	M	M
Facing tacking	Sewing facing seam, formed by joining forepart of lining to front facings, to canvas front	M	M	M	M
Buffed edge tacking	Basting front edge, holding and shaping front after facing is joined to forepart	-	-	M	M
Tacking pockets to canvas	Sewing each side of welt pocket to canvas	-	-	M	M
Tacking v's by hand	Sewing one side of front gore seam to canvas	M	M	H	H
Tape sewing	Stitching tape from top, around front edge and bottom to side seam	M	M	M	M
Shoulder joining, gorge sewing with hanger	Sewing front and back quarters of coat together at shoulder - sewing in lining yoke	M	M	M	M
Sleeve sewing	Joining sleeve to body of coat	M	M	M	M
Canvas basting	Sewing canvas front in forepart of coat by loose stitches to hold in place	M	M	H	H
Underpressing	The degree of underpressing affects the final appearance and fit of a coat. It cannot be measured in the finished garment. A #1 coat may have all the underpressing operations listed for a #4 but the care and amount of pressing for each operation may vary widely	-	-	-	-
Pressing buffed edge	Pressing edges of front of forepart under pressure to make a thin edge	-	-	M	M

See footnotes at end of table.

Table 26. Description of operations and workmanship in the construction of men's sack coats, grades 1,2,3, and 4 — Con.

Name of operation	Description of operation	Operation performed by 1/ Grade 1	Grade 2	Grade 3	Grade 4
Shaping fronts	Shaping front canvas, "hymo," by placing on pressing machine with a buck which has the desired shape and pressing and shrinking with steam	M	M	M	M
Shaping collars	Fitting collar to coat and cutting away excess fabric	M	M	H	H
Underbasting	Basting on undercollar before sewing shoulders	M	M	H	H
Pulling out basting from edge, trim, turn, baste, shape	Removing first basting (which held canvas (hymo) to forepart before tape, etc. was sewn in), trimming away overlapping edges of tape, canvas, padding, etc., basting facings, laying each forepart of coat together and cutting the front edges simultaneously to shape each uniformly, and turning forepart so right face of coat is in place	H 3/	H	H	H
Facing basting	Basting facings of forepart so they will be held in position when edge is pressed	M	M	M	M
Edge basting	Basting edges of forepart so facing and front will be held firmly together at edge when pressed	M	M	M	M
Lining basting	Basting in lining of forepart after lining and facing have been joined, basting in yoke lining after yoke or gorge shaping	M	M	M	M
Collar preparing	Marking undercollar line on coat before collar is attached	M	M	H	H
Collar setting tacking neck	Basting on undercollar to neck — Sewing end of undercollar to forepart of coat	M	H	H	H
Point tacking	Sewing top collar ends to facing	M	M	M	M
French felling	Sewing top collar to undercollar (lapping over)	M	H	H	H
Armhole basting	Sewing through the cloth, canvas, and lining of coat at armhole from front to hold all parts in place in preparation for joining sleeve to coat	H	H	H	H
Buttonhole making		M	M	H	H

See footnotes at end of table.

Table 26. Description of operations and workmanship in the construction of men's sack coats, grades 1, 2, 3, and 4 - Con.

Name of operation	Description of operation	Operation performed by 1/			
		Grade 1	Grade 2	Grade 3	Grade 4
Felling armholes	Sewing sleeve lining and body lining together	H	H	H	H
Felling shoulder	Sewing forepart of body lining to yoke	M	M	H	H
Felling undercollar	Sewing undercollar to back of coat	M	M	H	H
Felling sleeve bottoms	Sewing bottom of sleeve lining to outer sleeve	M	H	H	H
Felling side lining	Felling lining of forepart to side seam and bottom of lining to bottom hem	M	M	M	M
Cutting button-holes		M	M (Reece cutter)	H	H
Marking buttons		H	H (Ditto machine)	H	H
Button sewing S B		H	H	H	H
Button sewing D B		H	H	H	H
Examining and brushing		H	H	H	H
Bushel	Remove loose threads, etc.	H	H	H	H
Pairing	Assembling completed suits	H	H	H	H
Edge pressing and collar pressing	Pressing front edge and collar with steam machines	M	M	M	M
Sleeve and back sponging	Pressing with steam to remove shine left by previous pressing and shaping operations	M	M	M	M
Chest pressing	Final pressing of coat front	M	M	M	M
Armhole creasing	Pressing out armhole from inside	M	M	M	M
Finish pressing		M	H	H	H
Shape pressing		M	M	H	H
Edge stitching	Machine stitching front edges of forepart	M	M	M	M
Edge stitching	Machine stitching top collar	M	M	M	M

1/ H - Hand operation. M - Machine operation.
- - Operation not performed.

2/ Inside seam at top of pocket attaching pocket to (a) lower fore-part, (b) flap, at pocket opening.

3/ No cutting away of canvas at edge to give smooth thin edge.

Production Planning

There are two bases for production planning in inside shops: manufacturing to order, and manufacturing to stock. Manufacturing to order is the practice most generally followed in the industry. Orders are taken about six months prior to the production season. Some of the plants studied use this method. Manufacturing to stock is customarily used by plants which have retail outlets. Some plants use both methods. Plants which follow this practice use sales estimates to fill in small lots or slack production periods. (See table 27.)

After orders have been received or sales estimates have been made, materials are procured in advance of the production season in order to maintain continuous production during the season.

Production Control

There are probably as many different methods of controlling production as there are plants in operation. However, the general principles are fairly uniform, even though the methods vary.

Control involves keeping track of the fabrics, lots, bundles, findings, trimmings, and finished garments, as well as knowing at all times the location and degree of completion of all parts and garments in the shop.

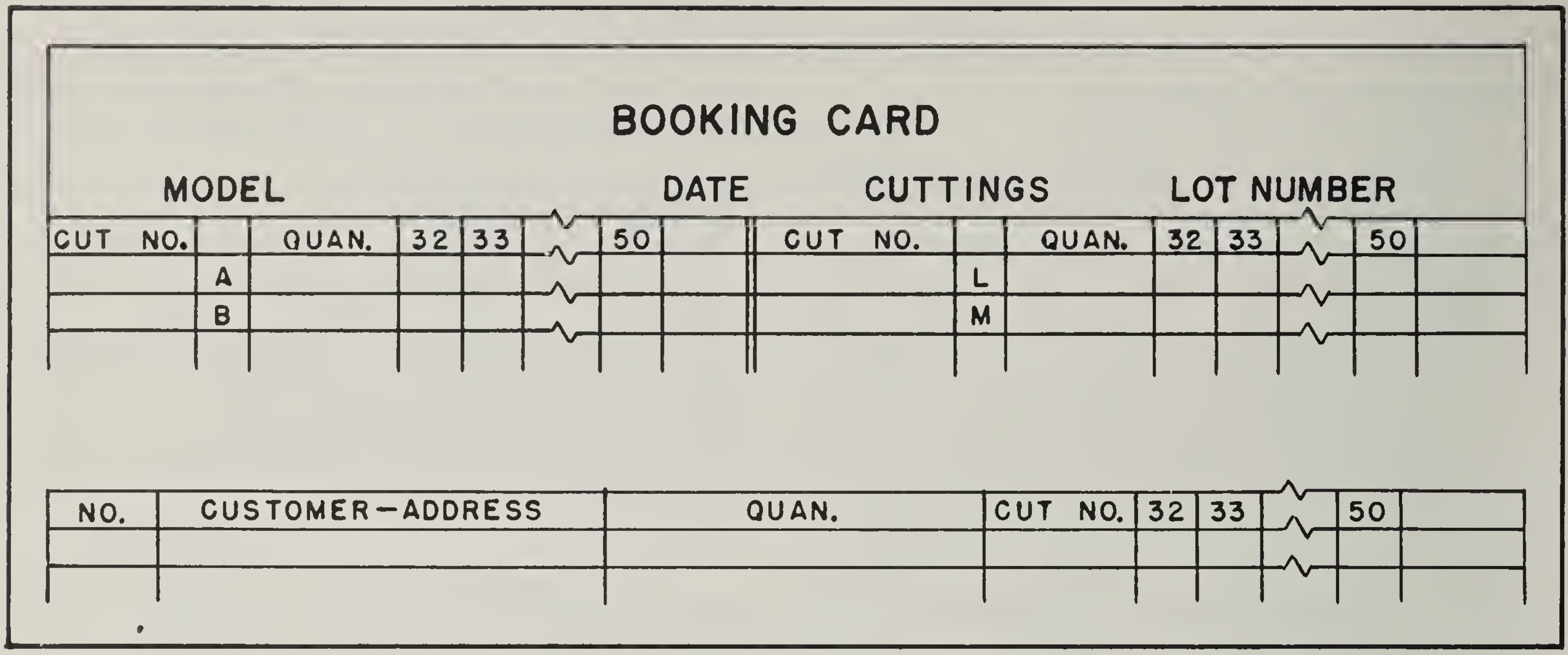
In inside shops, control begins when the customer's order is received in the manufacturing office.

Table 27. Method of estimating production and size of production lots of men's winter suits in 10 selected plants, U.S.A., 1950

Plant	Grade	Method of estimating production		Lot sizes		
		By sales estimate	By orders received	Average	Minimum	Maximum
A	4		X	100	35	250
B	4		X	100	5	400
C	4		X	35	1	120
D	3		X	20-25	1	45
E	4	10%	90%	180	20	250-300
F	2+	5%	95%	250	25	600
G	4+	X		1/ 200	(1/)	1/ 500
H	5		2/ X	5	1	20
I	4		X	30	5	60
J	3+	X		750		1000

1/ Continuous operations.

2/ When orders fall behind, sales estimates are used to determine production. Maximum production to stock is 5 percent.



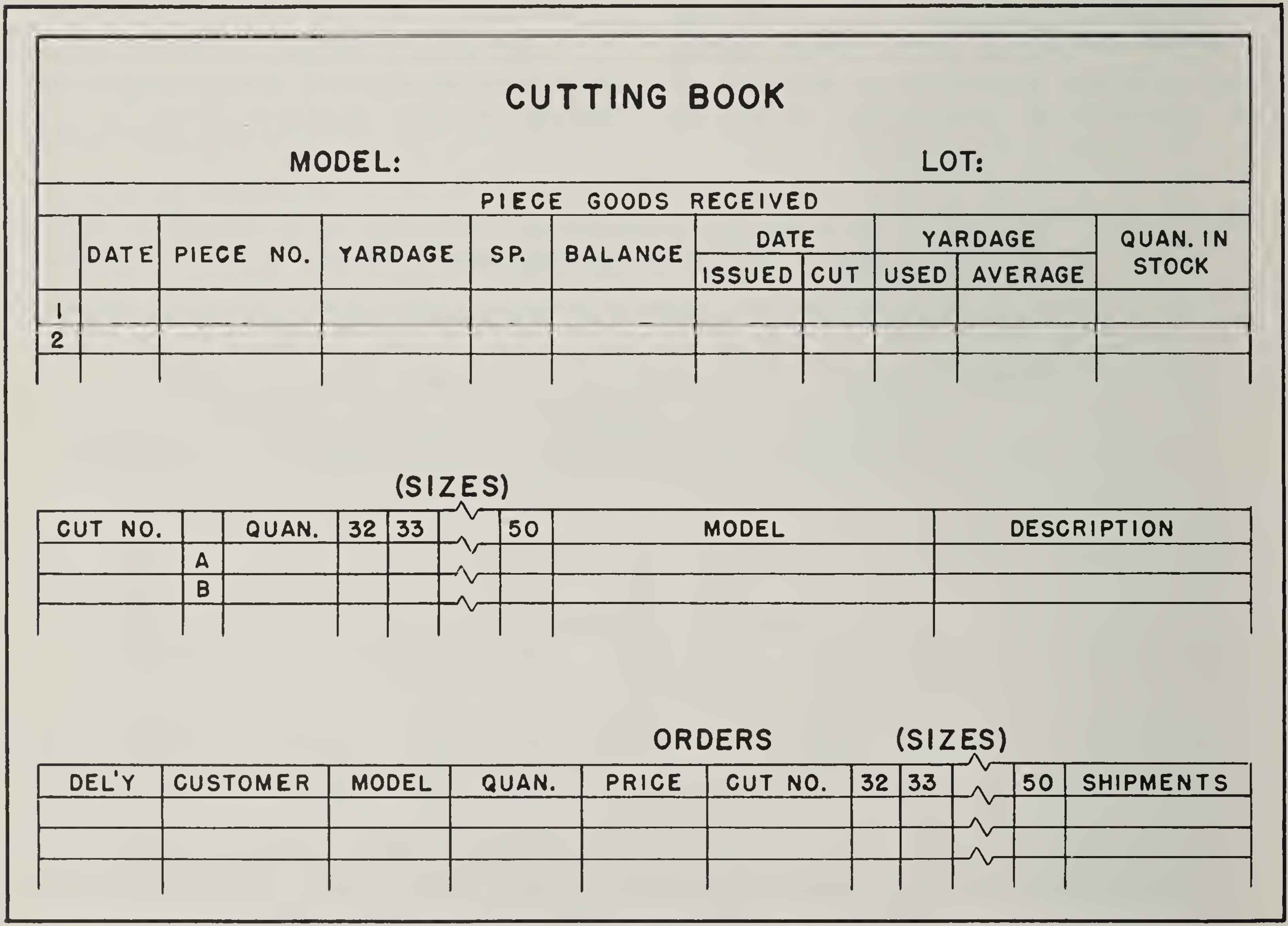
BOOKING CARD

MODEL DATE CUTTINGS LOT NUMBER

CUT NO.		QUAN.	32	33		50		CUT NO.		QUAN.	32	33		50	
	A								L						
	B								M						

NO.	CUSTOMER—ADDRESS	QUAN.	CUT NO.	32	33		50	

Fig. 1 Booking card.



CUTTING BOOK

MODEL: LOT:

PIECE GOODS RECEIVED

	DATE	PIECE NO.	YARDAGE	SP.	BALANCE	DATE		YARDAGE		QUAN. IN STOCK
						ISSUED	CUT	USED	AVERAGE	
1										
2										

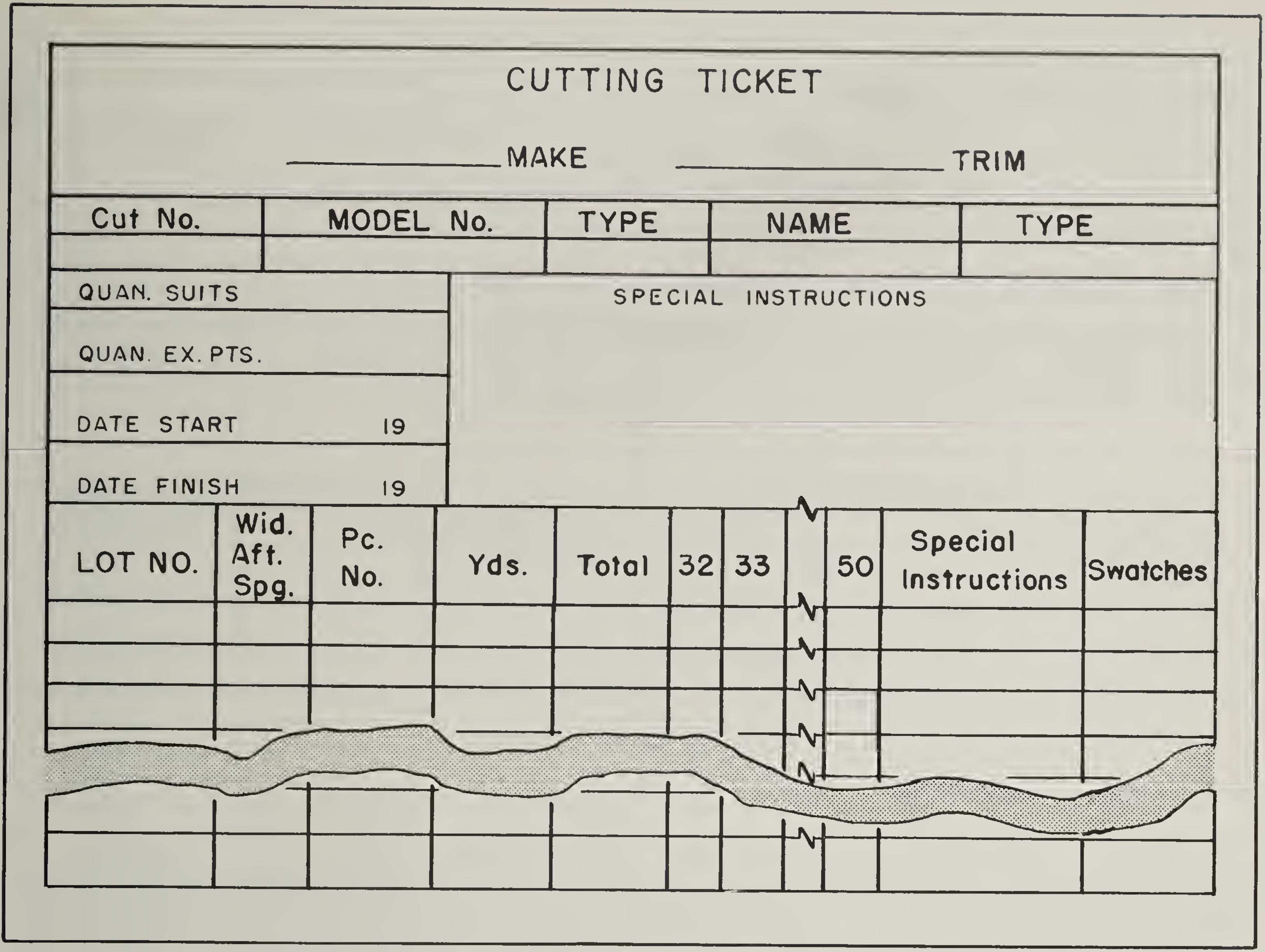
(SIZES)

CUT NO.		QUAN.	32	33		50	MODEL	DESCRIPTION
	A							
	B							

ORDERS (SIZES)

DEL'Y	CUSTOMER	MODEL	QUAN.	PRICE	CUT NO.	32	33		50	SHIPMENTS

Fig. 2 Cutting book.



CUTTING TICKET

_______ MAKE _______ TRIM

Cut No.	MODEL No.	TYPE	NAME	TYPE

QUAN. SUITS

QUAN. EX. PTS.

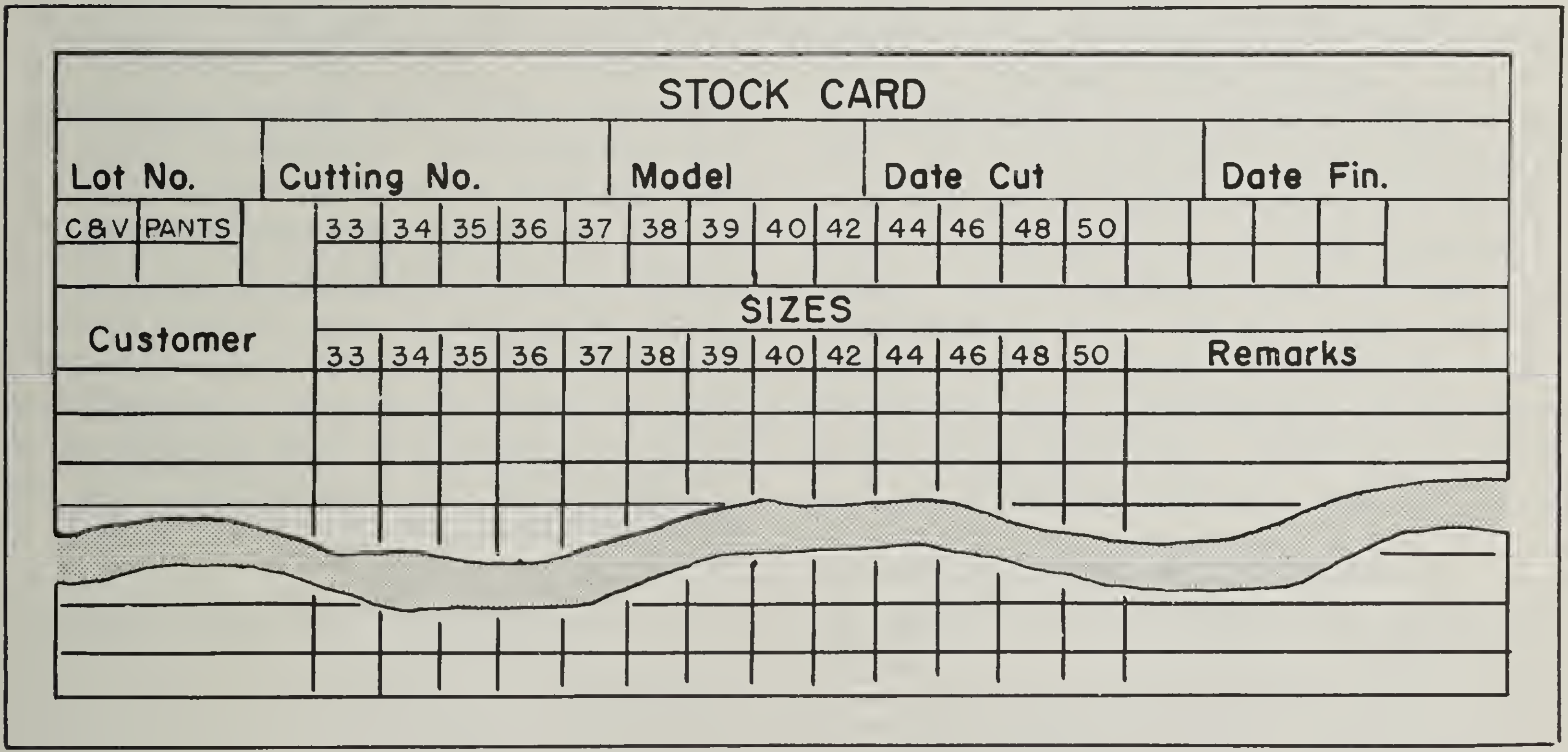
DATE START 19

DATE FINISH 19

SPECIAL INSTRUCTIONS

LOT NO.	Wid. Aft. Spg.	Pc. No.	Yds.	Total	32	33	50	Special Instructions	Swatches

Fig. 3 Cutting ticket.



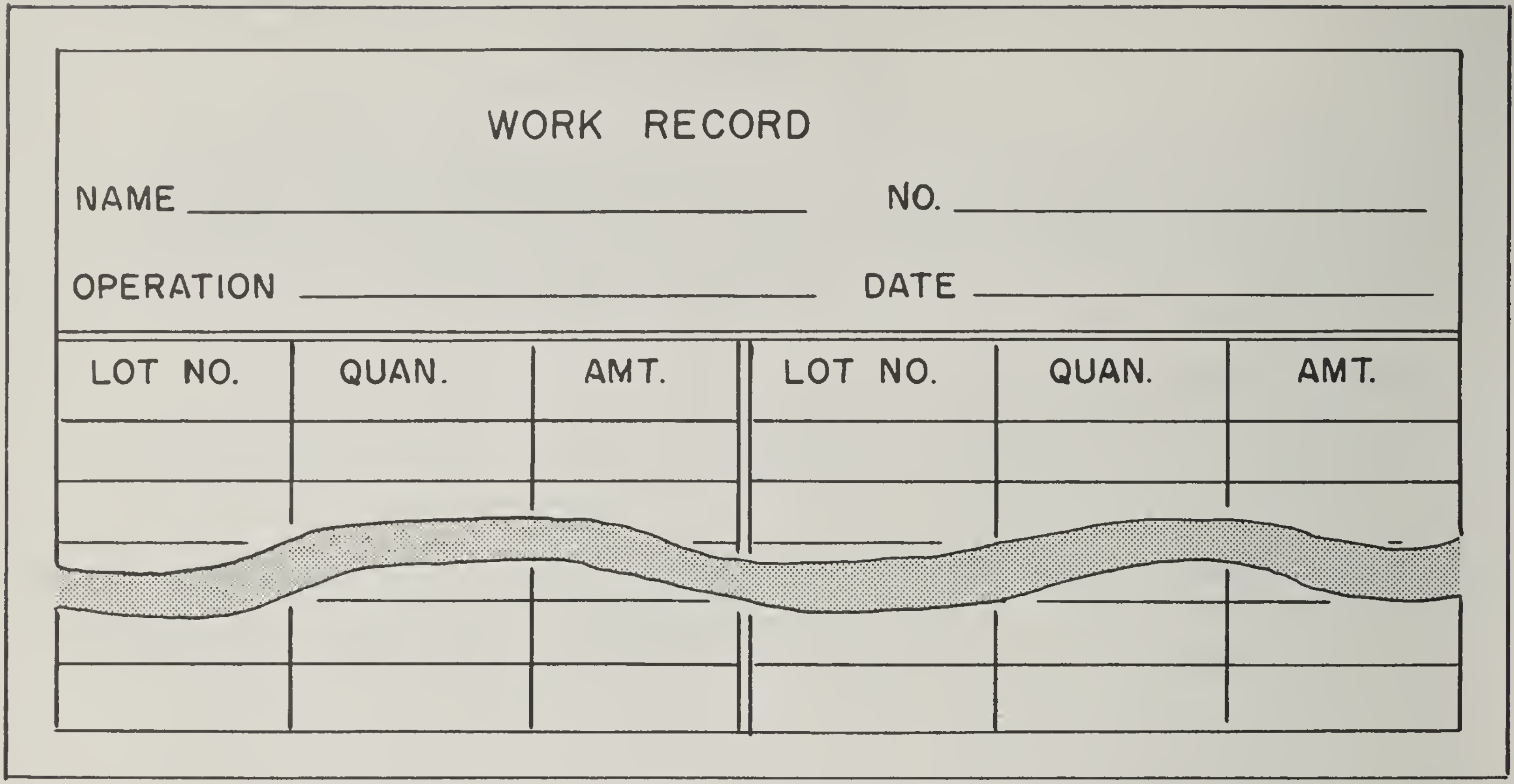
STOCK CARD

Lot No.	Cutting No.	Model	Date Cut	Date Fin.

C&V	PANTS		33	34	35	36	37	38	39	40	42	44	46	48	50				

Customer	SIZES													
	33	34	35	36	37	38	39	40	42	44	46	48	50	Remarks

Fig. 4 Stock card.



WORK RECORD

NAME ____________ NO. ____________

OPERATION ____________ DATE ____________

LOT NO.	QUAN.	AMT.	LOT NO.	QUAN.	AMT.

Fig. 5 Work record.

The foreman of the manufacturing department enters each order on a "booking card" (fig. 1). Each card represents a separate pattern and model number. The customer's name, address and the quantity and sizes of garments in the order are entered on the card. When enough orders have been received to begin an economical production run, all of the cards on a particular model are assembled, and a cutting number and lot number are assigned to each booking card ready for production. This is called making up a lot. Hereafter, all parts and garments made from that booking card will bear the lot number assigned to it.

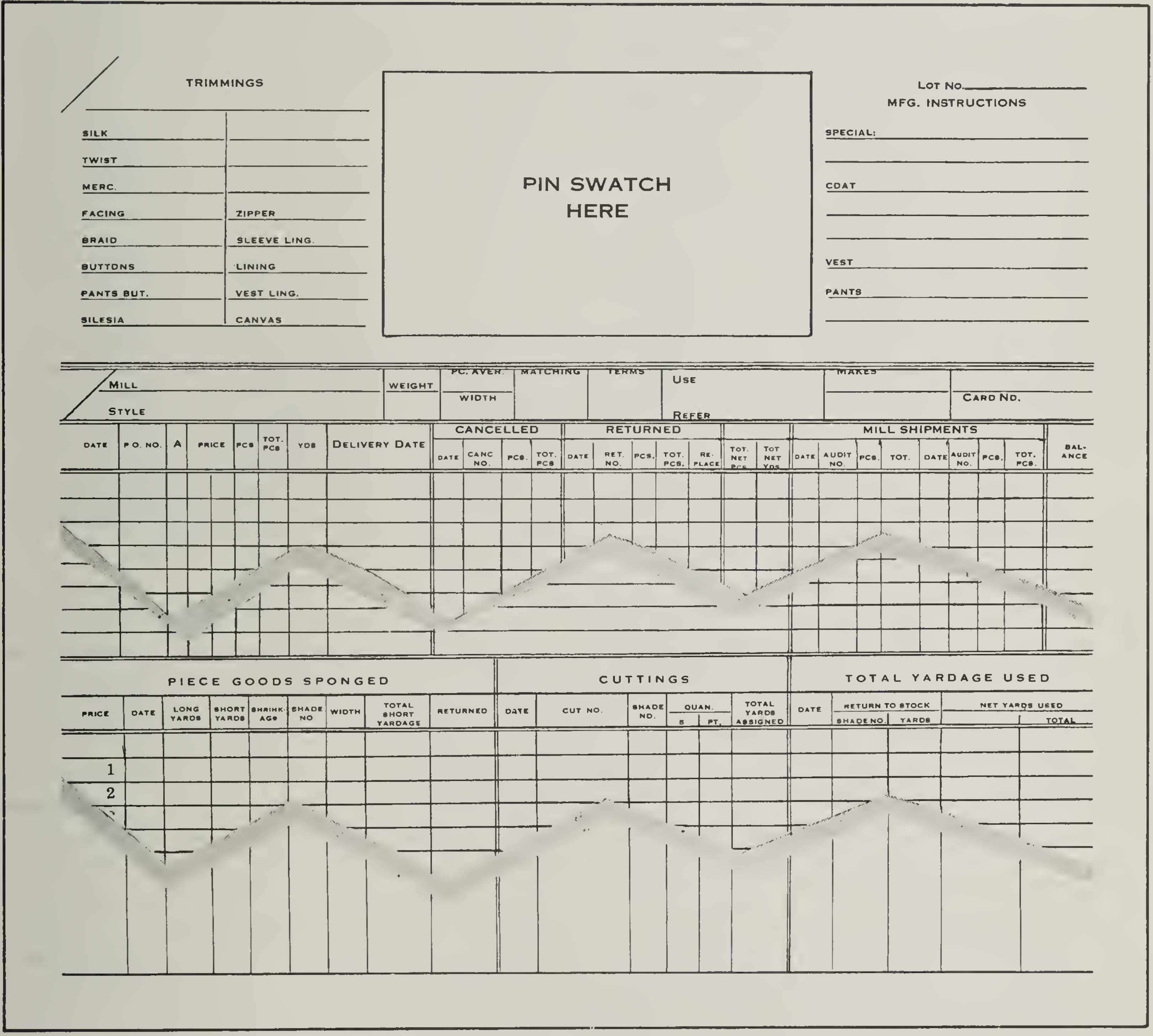
Information on each lot is entered into a "cutting book" (fig. 2). The date and amount of piece goods received, the yardage used, and the individual orders which will be filled are recorded in the cutting book.

There are several methods by which the cutter will obtain the required cloth from the piece-goods storeroom. For example, the required amount may be cut in the storeroom, or the whole bolt may be withdrawn and the balance returned. In general, however, the manufacturing department sends the cutter a memorandum or "cutting ticket" (fig. 3) showing the kinds and quantity of goods necessary for the cutting. A swatch of the material to be used is often attached to the ticket to further identify the cutting. The cutting foreman withdraws the required bolts of cloth from the stockroom on the basis of the memorandum from the manufacturing department.

A "stock card" (fig. 4) is made up from the cutting book and sent to the shipping department. The card contains the customer's name and the quantity ordered. When the completed lot comes through to the shipping department, the shipping clerk picks out the customer's order listed on the stock card and ships the finished garments to the customer.

Control over trimmings is generally in the hands of a stock clerk or the ship foreman, with a periodic physical inventory being taken to control shortages and determine the need for ordering supplies.

When the bundle method of production is used, a ticketing system is usually employed to identify parts. A semi-automatic ticketing machine numbers, prints, and attaches a ticket to each piece of cloth used in the suit. Some plants use a bundle ticket in place of marking pieces individually. This ticket is perforated into coupon tags for each



TRIMMINGS

SILK	
TWIST	
MERC.	
FACING	ZIPPER
BRAID	SLEEVE LING.
BUTTONS	LINING
PANTS BUT.	VEST LING.
SILESIA	CANVAS

PIN SWATCH HERE

Lot No.
MFG. INSTRUCTIONS
SPECIAL:
COAT
VEST
PANTS

MILL STYLE	WEIGHT	PC. AVER. WIDTH	MATCHING	TERMS	USE REFER	MAKES	CARD NO.

DATE	P O. NO.	A	PRICE	PCS	TOT. PCS	YDS	DELIVERY DATE	CANCELLED				RETURNED							MILL SHIPMENTS								BAL-ANCE
								DATE	CANC NO.	PCS.	TOT. PCS	DATE	RET. NO.	PCS.	TOT. PCS.	RE-PLACE	TOT. NET PCS	TOT NET YDS	DATE	AUDIT NO.	PCS.	TOT.	DATE	AUDIT NO.	PCS.	TOT. PCS.	

PIECE GOODS SPONGED									CUTTINGS						TOTAL YARDAGE USED				
PRICE	DATE	LONG YARDS	SHORT YARDS	SHRINKAGE	SHADE NO	WIDTH	TOTAL SHORT YARDAGE	RETURNED	DATE	CUT NO.	SHADE NO.	QUAN.		TOTAL YARDS ASSIGNED	DATE	RETURN TO STOCK		NET YARDS USED	
												S	PT.			SHADE NO.	YARDS		TOTAL
1																			
2																			

Fig. 6 Perpetual inventory record

operation performed in the making department. In both methods of identification, the tag is printed with the bundle number, model number, cut number, and quantity of pieces in the bundle.

If the ticketing system is used, a record of daily production is generally kept by the individual worker. As the worker gets a bundle he enters the lot number and the number of pieces in the bundle on his daily "work record." (Fig. 5) When bundle tickets are used, the coupons corresponding to the particular operation are torn from the ticket and pasted on gummed sheets. Control is maintained by the foreman in charge of the shop who keeps a record of the bundles which are distributed to the workers, the numbers of the bundles being checked off against the list kept by the worker on his work record. The work record on gummed sheets are turned in at the end of the day and used as a basis for computing piece rates.

A running or "perpetual inventory" is kept on piece goods. This form is a detailed record of the ordering, receipt, and disposal of each bolt of piece goods received in the plant. The amount of cloth in the bolt is stated on a bolt ticket. When cloth is cut from the bolt, the amount is deducted and the new balance entered on the ticket. An illustration of a perpetual inventory record is shown in fig. 6 .

The Incentive Pay System

The men's suit and coat industry has an outstanding record of union-management cooperation. Some of the more important aspects of this cooperation other than wages and hours are social insurance, a health center, improved factory working conditions, and a wage stabilization program.

The wage stabilization program has become an important factor in the productivity of this industry. This program is based on a grading system for the garments and a piece-rate system by which the workers in the making department are paid a set rate per unit.

After the Amalgamated Clothing Workers Union came into prominence, the piece rate, or incentive system as it is also known, was supported by the Union. The first attempt made by the Union to stabilize wage rates in 1933 was partially successful. In 1939, by revising and expanding their first attempt, wage stabilization based on the piece-rate system was placed on a more satisfactory basis. In that year the Union hired an outside expert to study the difficulties, and proceeded to set up a Stabilization Department under his direction. In addition, a joint union-management committee worked out a plan for putting the standardization program on a national basis.

The manufacture of men's suits and topcoats has been classified into six categories based, among other factors, upon the quality and the amount of hand sewing in the garment. Plants identified as manufacturing a certain grade of garment will usually produce only that grade of garment, regardless of whether the plant is an inside or contract shop. Grades 1 and 2 are the lowest price group with very little hand sewing and form the cheaper grades of fabrics and findings. Grades 3 and 4 are the medium price group, usually with hand-sewn buttonholes, hand felling on the collar and sleeve linings. Grades 5 and 6 constitute higher priced groups, with generally excellent fabrics, trimmings, and a considerable amount of hand sewing, especially in the buttonholes, collar, front, and shoulders.

On the basis of these classifications, the over-all wage cost for the garments is fixed by the union's Stabilization Department and management on a nationwide scale. The wage cost for the whole garment in any particular classification, therefore, will be substantially the same in all shops. As a result of differences in product and region, the wage cost of a particular garment may not be the same in every plant, but it is usually so similar that competition based on the wage cost of classified garments is considered practically eliminated.

After the wage cost for the garment is fixed by collective agreement, the piece rate for each section of the garment is ordinarily settled in accordance with the classification of the garment. The worker's shop committee, a union price expert, and the individual employer undertake joint negotiations. In other words, the wage cost established in the collective agreement is divided among the workers of different skills who make the garment. The schedule of piece rates is then filed with the Stabilization Department of the Union, which is charged with the supervision of the rates. After the schedules of piece rates are filed with the Stabilization Department, the Research Department of the Union examines them for any unusual deviations from the standard. If it is found that the schedule of piece rates, or the so-called "price list," is not in line with classifications or specifications, the Stabilization Department may ask for corrections or changes. The majority of employers have cooperated in maintaining wage costs as well as rate standards. They have done so in their own interest. Because the piece rates are negotiated with a large number of individual employers, they may vary among shops. However, experience shows that a marked degree of uniformity has developed in the single markets.

The policy of wage stabilization has created difficulties, and has been criticized by both employers and employees. Both parties concerned have nevertheless considered it preferable to other methods which might have brought with them serious disadvantages for employers as well as workers. The ultimate goal of union-management schemes has been the highest possible degree of wage standardization. Accordingly, attempts have been made to raise prevailingly low local wage rates to the national level. Outside competition no longer seriously disturbs this policy because nonparticipants are mostly small firms and represent only a small percentage of the companies in the industry. Competition formerly based on wage differentials has been supplanted to a large extent by competition based on other factors such as efficiency in production, style, and buying and selling ability. (See tables 28 and 29.)

Fabrics, Suit Quality, and Workmanship

Worsted and woolens are the two types of cloth used for suiting in the United States. The yarn in worsted fabrics is made from long wool fibers combed parallel and twisted into strands. Two-ply fabric is made from yarn composed of two

Table 28. Employment, salary, and wages in the men's and boys' suit and coat industry, 1947

Item	Employees	Salaries and wages
All employees, average for year . . .	146,768	
Salaries and wages, total . . .		$396,244,000
All production workers, average for year	132,866	
Average annual wage		$2,492
All salaried employees, average for year	13,902	
Average annual salary		$4,682

Source: Census of Manufactures, 1947, Bureau of the Census, U. S. Department of Commerce.

Table 29. Hours and wages in the men's and boys' suit and coat industry, U.S.A., 1949

Item	All manufacturing industries	Men's and boys' suit and coat industry
Average hours worked per week	39.2	34.7
Average hourly earnings	$ 1.401	$ 1.296
Average weekly	$54.92	$46.67

tightly twisted strands. Woolen fabrics are usually made of one-ply yarn loosely twisted and woven. The fibers are coarser, and are composed of both short and long uncombed fibers. Worsted suitings include such fabrics as gabardines, serges, sharkskins, and unfinished worsted. The woolen fabrics are tweeds, twists, and homespuns. Coverts, cheviots, and flannels may be either worsted or woolen fabrics. Eighty-five percent of all suits are made from worsted fabrics.

In order to protect the retailer and the consumer, the Wool Products Labeling Act was passed by Congress in 1939. The provisions of the act state that every product containing wool must be marked with a means of identification bearing the percentage distribution of the total fiber by weight, exclusive of ornamentation (not to exceed 5 percent of the total weight). The percentage of the kind of wool, and whether the wool is new wool, reprocessed or re-used, must also be designated.

Merchandising Practices

There is a high degree of specialization of the product manufactured in the men's apparel industry in the United States. Men's dress and sport shirts, pajamas and underwear, and suits and coats are usually manufactured by separate companies.

The men's apparel manufactured by the plants studied were men's suits, overcoats and topcoats, sport coats, and slacks. One plant reported the manufacture of some formal wear. Most of the plants studied offered 10 to 15 models of suits, and a range of 150 to 400 styles. The size range offered was about standard for the small sizes in all reporting plants, but varied widely for larger sizes.

Over 90 percent of the men's clothing sold today is "ready made." Most firms sell direct to retailers or through their own stores. About 20 percent of the total production is done by manufacturers who operate their own retail outlets. The tailor-to-the-trade concerns, i.e., custom shops making garments to individual order, produce about 10 percent of the industry's output, and are of decreasing importance in the United States.

The method of distribution of the finished product varies with the

Table 30. Merchandising practices in 10 selected plants in the men's winter suit industry, U.S.A., 1950

Plant	Grade	Models offered	Degree of specialization			Retail outlets
			Styles offered	Size range	Other apparel manufactured	
A . . .	4	6	200	35-46	Sport coats, slacks	No 1/
B . . .	4	10	150	35-46	Topcoats, overcoats	No 1/
C . . .	4	10	150	35-56	Slacks	No
D . . .	3	(2/)	(2/)	32-56	None	No
E . . .	4	10	350	36-50	Sport coats, slacks	No
F . . .	2+	25	300	34-44	Sport coats, slacks, topcoats	No
G . . .	4+	15	400	34-54	Slacks, topcoats, overcoats	Yes
H . . .	5	22	353	34-56	Sport coats, slacks, topcoats, overcoats, formal wear	Yes
I . . .	4	14	200	34-52	Sport coats, slacks, topcoats, overcoats	Yes
J . . .	3+	5	279	33-52	Topcoats, overcoats, slacks, sport jackets	Yes

1/ Plants A and B do not use brand names. All other plants sell wholly or partially under a brand name.

2/ Data not available.

individual company and is determined by the policy of the company. Some manufacturers frecuently utilize a combination of methods, performing the function of manufacturer, wholesaler, and retailer, but in general a manufacturer's distribution is determined by his individual method of doing business. (See table 30).

In the men's winter suit and topcoat industry, the principal channels of distribution are: direct selling to retail clothing stores, manufacturing retailers, mail order houses, department stores, and wholesalers. Direct selling by the manufacturers is the dominant type of distribution in the industry. Direct selling is almost a functional necessity due to the seasonal nature of the industry. The large markets such as New York City and Chicago make it easy for the retail clothing store buyer to go to the market and purchase his orders direct.

Case Study Data on
Productivity and Factory Performance

MEN'S WINTER SUITS AND TOPCOATS

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CHAPTER V: INDUSTRIAL RELATIONS IN THE MEN'S AND BOYS' CLOTHING INDUSTRY [2]

Introduction

Large increases in productivity have been recorded in most industries in the United States in recent decades. These increases in output per unit of labor time have been the result of extensive technical improvements in equipment, methods of production, and in management. In substantial measure they also reflect worker adjustment to technical changes, improvements in worker efficiency, and union aid in making adjustments easier.

Any attempt to evaluate the extent to which workers participate in the benefits of increased productivity requires a two-fold approach. Sharing of increased productivity cannot be accomplished by any mechanical formula which automatically divides the gains. In the long run, workers have shared if their real earnings and their standards of living have improved. They have shared if their leisure has increased through a shorter workweek, vacations, sick leave, and provisions for retirement. It is important, therefore, to review the general development of labor standards in an industry in order to form some opinion as to whether workers have shared in the benefits.

The long-run adjustments are, however, not a complete answer to workers who are affected by technical changes. It is important to know what special measures can be adopted to meet specific conditions of job security, levels of earnings, quality of employment, health, and protection against hazards. Short-run adaptation to increased productivity may require regulation of the rate of introduction of technical changes; the retention and placement of workers in changed jobs; the maintenance of the level of earnings on new jobs or provision of even higher earnings; dismissal compensation when the work force must be reduced; or a variety of similar measures.

In our study of the men's clothing industry, attention has been given to both long- and short-run measures directed toward sharing the benefits of increased productivity. It should be kept in mind, however, that the maintenance of full employment is a problem entirely apart from that of job opportunities and technical changes, with the former now recognized as a matter of national economic policy. To the extent that full employment is maintained, the threat of insecurity is lessened, adjustments are easier, and worker cooperation for increased productivity can be obtained more easily. Sharing of benefits is obviously easier during periods of abundance. Even under conditions of full employment, however, technical changes do create problems of adjustments for the workers involved.

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[2] Prepared by William S. Gary, under the supervision of Kirk R. Petshek, in the Division of Wages and Industrial Relations, Bureau of Labor Statistics, U. S. Department of Labor.

Collective Bargaining

More than 95 percent of the workers in the men's clothing industry are organized by the Amalgamated Clothing Workers, affiliated with the Congress of Industrial Organizations.

The union, which was founded in 1914, is proud of its democratic organization. Although the supreme governing body is the convention, General Executive Board exercises this function between conventions and has general supervision over its affairs. The basic policy-making and day-to-day bargaining unit is a Joint Board in each urban center, comprising locals of the city dealing with men's clothing, whose paid officers are elected by the general membership. The national office decides basic policy only on issues of national importance such as the general wage level, hours, and insurance agreements. Most of the locals of the Joint Boards are organized on an industrial basis. In the exceptional cases where a local is organized on a craft or nationality basis, the reason is historic and the local either becomes a member of the Joint Board or cooperates closely with it.

From its inception, the leaders of the Amalgamated recognized the economic fact that benefits achieved through collective bargaining can be wiped out by instability in the economic system. Therefore, the union believes that its own organization and institutions must play an active part in social, economic, and political affairs locally and nationally in order to protect their own gains and to make further progress possible.

The following quotation from a speech by the late Sidney Hillman, the union's first president, captures in some degree the ideals and spirit underlying the Amalgamated's goal:

"We want a better America, an America that will give its citizens, first of all, a higher and higher standard of living so that no child will cry for food in the midst of plenty. We want to have an America where the inventions of science will be at the disposal of every American family, not merely for the few who can afford them. An America that will have no sense of insecurity and which will make it possible for all groups, regardless of race, creed, or color to live in friendship, to be real neighbors; an America that will carry its great mission of helping other countries to help themselves."

This liberal philosophy emerged gradually from the wedding of the early union leaders' socialist beliefs with the more indigenous American trade-union concern with immediate gains through collective bargaining. Although vitally concerned with the latter, the Amalgamated has directed its interest also to such matters as labor banking, cooperative housing, sickness benefits, and health centers. Its policy in collective bargaining is characterized by the realization that over the long run economic advantages for the workers must be based on a sound economic condition of the employer. Hence, the union considers it a sound policy to be concerned with such conditions as the competitive situation in the labor market and the consequences of its demands upon employment in the industry.

Because of the small size of many firms, which makes efficient bargaining difficult, the union has welcomed the formation of area-wide employer associations, often founded for bargaining purposes. Most of the larger clothing centers have their own manufacturing associations today. They are united in the Clothing Manufacturers' Association of the United States.

Collective bargaining today is conducted in a two-fold manner. General changes in wages, hours, and working conditions are negotiated between the officers of the Amalgamated and the Manufacturers' Association. The general provisions agreed upon at the national level are incorporated in area-wide agreements negotiated between the Joint Boards and the local Associations. The individual employers then sign this local agreement. The union negotiators allow the individual clothing markets a certain amount of discretion with respect to adjustments arising out of economic conditions peculiar to the market, with particular attention given to the problem of equalizing costs on the same kind of work.

This type of bargaining in the men's clothing industry is a natural outgrowth of an economic structure composed of many small competitive producers clustered in a few major markets and a strong, centrally directed labor union. Prior to negotiations at the national level and the determination of rates through the union's stabilization plan discussed below, competition in terms of labor costs between the various markets resulted in loss of business to lower-cost markets and an exodus of employers to areas with lower labor cost. Since 1937, however, all major changes in wages and working conditions have been negotiated at the national level, and this practice has tended to stabilize both costs and location.

In this industry, formalized collective bargaining followed rather than preceded working relationships between labor and management (which relations sometimes developed even to the point where arbitration machinery functioned smoothly). An arbitration board was first established to settle the many grievances which had led to a strike in one of the major firms prior to World War I. Soon thereafter, the system was formalized and spread through that particular labor market, and agreements between the union and the employers provided only for the establishment and the refinement of this machinery. Inasmuch as specific agreement terms had not been negotiated, the local arbitration boards had to base their decisions upon general equitable considerations. Gradually, the matters decided by direct negotiation increased. But what happened in considerable measure was that the "common law" established through arbitration decisions in one or two labor markets was incorporated into collective agreements. Some of the early collective agreements, therefore, represented to some extent a codification of existing practices and understandings.

At the present time, agreements in the industry contain provisions relating to wages, hours, equal division of work in slack periods, limitation of overtime, contracting work, union security, and other matters of general importance. The major changes in agreement provisions are now negotiated directly by the parties. The arbitration machinery still exists and provides a mechanism by which disputes arising from the application and interpretation of the agreement can be settled. In addition to the formal provisions of union agreements and of arbitration decisions, oral understandings and traditional practices are respected by the union and the employers, and constitute part of the working environment of the industry.

Production Changes

Over the past 25 years (and probably over a much longer period) the industry has not undergone any striking industrial changes or experienced many revolutionary innovations. It has been a matter of gradually improving existing models of machines and adding a tool here or there. Greater productivity has been more the result of increased efficiency and better organization than of decisive technical change.

Originally, union policy, as embodied in early agreements, permitted the introduction of new machines provided earnings of workers were not affected by this process. Irrespective of the amount of skill required for the new operation, the union attempted to get piece rates set high enough to result in earnings as large as before unless the employer wanted to transfer the displaced workers to equally paying jobs elsewhere in the plant. This union attitude, however, was modified when union firms were threatened by serious competition from lower-cost nonunion firms. Piece rates could now be set in relation to the skill the operation required. Displaced workers, however, had to be transferred to equally paying jobs. The union became flexible on its demand that earnings could not be lowered, and helped employers find jobs for displaced workers. This attitude towards new machines has remained characteristic for the union, and union leaders have sometimes urged that such new machines be introduced.

Although specialized machinery is used widely in this industry, the fact remains that the production of men's clothing is essentially a man-paced operation. Highly specialized workers must watch and prepare every operation carefully in order to protect the garment and its quality. As the quality of the product is frequently important and the designs, materials, and fashions vary, the scope for additional mechanization appears severely limited.

Technology, methods, and production organization have not been static, however; there have been many improvements over the years. The union has for the past quarter-century been almost invariably a party to--and frequently the initiator of--these innovations. It has usually been able to convince the workers that the innovation will not be to their disadvantage on the basis of experience of other plants where a new process or method had been tried. Although the union has continuously realized the importance of more efficient production, it has been keenly aware of the employment problem involved and has controlled the introduction of changes so that few displacements have occurred.

If the workers are not satisfied with the wage rate set on the new job, or with any other aspect of the innovation, an elaborate machinery is at their disposal, culminating in arbitration, to consider their grievance. The impartial chairman is selected by the parties in every market on a permanent basis. This permanence gives him an opportunity to understand prevailing conditions as well as the economic and human background of the industry. The arbitrator's award usually represents a workable solution to the problem with which both parties can live comfortably, because mutual confidence exists between them.

The union has gone further. It has taken active part in production problems, often giving the employers direct assistance in cutting costs and improving operations. Management tends to rely on the union for this type of assistance because the small size of firms is not conducive to coordinated management research. The union business agents, all specialists in their own right, have the advantage of acquiring familiarity with the methods used in a variety of plants in the industry and are able to judge the best ways of handling operational problems. This knowledge is being made available to those employers who experience competitive difficulties. Frequently the best deputies are transferred temporarily to other areas to help improve management and production techniques, so that they perform something akin to an industrial engineering service on a modest scale. In some cases, the union insists upon better work arrangement, better plant lay-out, more competent supervision, or more efficient training and operation in firms asking wage rate concessions.

Table 31. Employment of production workers in the men's and boys' suit and coat industry, U.S.A., 1947-52
(In thousands)

Month	1952	1951	1950	1949	1948	1947
Average	(1/)	133.8	134.3	128.1	140.1	138.4
January	127.2	138.4	130.3	135.4	143.1	134.1
February	.5	141.1	135.2	138.7	142.5	136.1
March	.5	141.0	135.5	137.3	143.6	136.9
April	120.7	138.2	131.7	133.7	140.7	136.1
May	113.0	135.0	129.0	117.7	139.3	136.0
June	119.4	135.4	134.6	121.5	140.5	138.5
July	117.0	129.3	126.9	115.9	132.4	133.5
August	127.7	139.2	138.2	130.6	144.1	139.6
September	129.2	138.0	137.4	133.4	144.0	140.7
October	(1/)	137.4	138.2	128.6	141.5	142.7
November	(1/)	117.1	137.0	117.6	135.3	143.0
December	(1/)	122.5	137.4	127.3	134.7	143.3

1/ Information not available.

A well-known case involved union cooperation with the large firm of Hart, Schaffner, and Marx in producing, largely upon the suggestion of the union, a less expensive brand of clothing. The union enabled the firm to lower total labor cost by permitting and helping with the substitution of machines for hand operations and a better division of labor and routing of materials. The cheaper suit soon sold better than the old brands. Less spectacular examples abound. For example, a firm in Cincinnati, on the verge of bankruptcy, solicited the union's help. The expert business agents for the coat, vest, and pants shops, respectively, were brought in from Chicago, and suggested the following methods for greater specialization of the work force; (1) installation of pressing machines instead of hand pressing; (2) simplification of the methods of constructing the garments; (3) shifting of pattern racks closer to the cutters; and (4) improvement in the patterns to lower the cost of cutting. These were only a few of the suggestions resulting from many weeks of research by the Chicago experts.

In essence, then, the large part union-management cooperation has played over a long period of time has eliminated friction and other problems which might have arisen from those production changes which have been possible in this industry.

Labor Standards

Method of Wage Payment. At one time workers in this industry were among the Nation's lowest-paid employees. Earnings in the men's clothing industry are now at a relatively high level.

The large majority of the men's clothing production workers are paid on a piecework basis. The nature of the industry lends itself to this system. The cutters are the most important exception, because their work is not easily adaptable to this method of wage payment.

Conflict ensued within the union when this system was first preposed for general use. The workers in the important New York market were strongly opposed to piecework because of their experience with sweat shops, while the Chicago workers did not object to this system and asked only to be protected against rate cutting. As a result, at almost every convention, New York and other time-work centers pressed for the elimination of piecework, whereas Chicago and other piecework markets fought for its retention. Labor costs in New York and other time-rate markets were higher than those in piecework markets, which resulted in shifts of trade from the former to the latter. Thus, New York wanted to equalize labor costs and Chicago wanted to protect its advantage. Patient and diplomatic efforts by management and union leaders, Sidney Hillman prominent among them, gradually convinced the workers that piece rates were efficient and could be administered without any threat to wage standards. Piece rates were finally adopted in all markets.

The setting of piece rates, particularly if they are supposed to be uniform, encounters great difficulties in the clothing industry. Aside from the differences in skill, equipment, and organization found everywhere, the quality of the finished product and the constant changes in models make it a particularly complicated task. Division of work is often highly advanced. The materials used for various parts of a suit or coat vary widely, and with them the amount of work involved. Thus, the fixing of piece rates is a continuous task if it is to keep pace with all new models, materials, and style changes.

Long before the later spectacular development of stabilization of labor costs, the union was intimately involved in rate setting. As a rule, the Joint Board would send its representative who examined the operation, and, jointly with the employer, fixed the rate. At the time of the great depression in the 1930's, which caused drastic production and employment declines, increasing pressure developed in the industry for wage reductions. The Amalgamated, being chiefly concerned with continued employment for its members, recognized that the labor costs of their employers had to be sharply reduced. Although they realized that they had to agree to wage cuts, they pressed for a procedure to establish greater stability and uniformity throughout the industry. It was then decided not to try setting up uniform piece rates but to establish a uniform minimum labor cost for each entire garment.

A program for standardization of labor costs on a national scale was worked out by the union leaders in conferences with technical experts, employers, and local unions. In this way, the details of the stabilization plan were developed. A Stabilization Department was established by the union. All production was classified into six grades. The cheapest was grade 1, with an increase in skill requirements through grade 6.

The crux of the plan lies in the fact that total labor costs for each grade of garment is fixed, rather than piece rates for each individual operation. This leaves each employer free to distribute the cost among his workers within reason, to divide the work differently, with emphasis on those parts of the process which he considers important, and to choose his methods and machines. Although total labor cost is fixed, the employer is free to apply the methods most appropriate to his particular operation. In this way, efficiency and quality are protected.

In practice, where economic or specialized conditions warrant, a certain flexibility is permitted with the approval of the union's Stabilization Department. Shops in outlying areas are occasionally given certain cost advantages, lest they be driven out of business. Nor does the attempt at unifying total labor cost blind the union to the fact that the resulting piece rates must be comparable for similar work. The work itself, however, varies sufficiently under this system to make two operations more often dissimilar than similar. Although the employer can vary his method by emphasizing one operation rather than another (e.g., more pressers' time and less work of the finishers), the union sees that the same piece rates are paid for work it considers comparable. Beyond that, whenever rates are changed, the local will see that earnings are maintained at the old level. In different ways and at different levels all three aspects of wage payments are unified -- total labor cost, earnings, and piece rates.

Level and Structure of Earnings. In March 1952, average hourly earnings in the industry were $1.49. Earnings for an average workweek of about 35 hours averaged $52.38. These general levels of wages compare favorably with wages in other light manufacturing industries employing substantial proportions of women.

The industry's wage structure was indicated by a detailed study made of occupational earnings in 10 important areas in March 1951. Although men and women predominate in different occupations, they are paid the same piece rates on the same jobs. Earnings therefore, reflect the individual's performance. Among the occupations selected for study, male cutters and markers averaged $2.27 an hour in all areas combined. In coat fabrication, women hand finishers averaged $1.26, women sewing machine operators $1.51, and male pressers $2.08. In trouser fabrication, women sewing machine operators averaged $1.47 and male pressers $2.15. Only janitors and bundle (or work) distributors in a few of the areas earned less than $1 an hour.

The level of occupational earnings varied among areas, with the highest earnings reported in the New York-Newark-Jersey City area, followed by Los Angeles. In most occupations the lowest earnings were found in the St. Louis area. These intercity differences reflected a variety of factors, including differences among areas in types of garments produced.

Earnings for individual workers vary widely even within the same occupation in the same area. The differences tend to be conspicuously large in piece-rate occupations and reflect, in part, differences in individual productivity. Variations in earnings among cutters, who are paid time rates, are small.

Hours, Vacations, and Holidays. The clothing industry was once characterised by excessive hours of work, particularly during the busy season. Today, the workers are employed generally for 40 hours a week. All regular work is performed from Monday through Friday, and work outside the regular schedule is generally paid for at overtime rates.

Workers receive from 1 to 2 weeks' vacation pay under their collective agreements, depending on length of service, with the majority receiving 2 weeks. It is common practice in the industry to shut down plants during the first 2 weeks in July, at which time most employees' vacations are scheduled.

In addition to the paid vacations, the contracts provide for 6 paid holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas. In many instances, several unpaid holidays are also made available to the workers.

Worker Security

The peaceful, uninterrupted enjoyment of work and leisure of any group of workers is threatened by temporary lay-offs and permanent loss of the job, as well as by sickness, accident, and old age without income. Through different means and from different sources, a measure of protection of workers from these dangers and disturbances has been worked out in this industry.

Seasonality has been mentioned as one of the problems of the industry. Combined efforts by management and labor have attempted to cope

Table 32. Straight-time average hourly earnings 1/ in selected occupations of the men's and boys' suit and coat industry, U.S.A., March 1951

City	Coat fabrication					Trouser fabrication			Miscellaneous	
	Cutters and markers (men)	Hand Finishers (men)	Sewing machine operators		Machine Finishers and pressers	Sewing machine operators		Pressers and Finishers	Janitors (men)	Work distributors (men)
			Men	Women		Men	Women			
Average	$2.27	$1.26	$2.01	$1.51	$2.08	$1.86	$1.47	$2.15	$1.06	$1.03
Baltimore	2.16	1.22	1.72	1.37	1.85	1.66	1.35	2.23	.84	.94
Boston	2.36	1.27	1.88	1.39	2.02	1.78	1.53	2.26	1.02	.98
Chicago	2.18	1.22	1.74	1.52	1.95	1.72	1.51	2.24	1.23	(2/)
Cincinnati	1.96	1.31	1.91	1.47	2.19	—	1.37	1.97	.90	—
Los Angeles	2.28	1.44	2.09	1.68	2.48	—	1.61	2.16	1.21	—
Newark-Jersey City	2.55	1.38	1.96	1.68	2.25	—	—	—	1.32	1.30
New York	2.48	1.27	2.14	1.64	2.11	1.93	1.59	2.20	1.08	1.14
Philadelphia	2.22	1.25	1.98	1.55	2.15	1.81	1.53	2.19	.90	.88
Rochester	2.07	1.17	1.78	1.46	1.89	1.56	1.40	1.87	1.17	1.11
St.Louis	2.05	1.07	—	1.38	2.09	—	1.24	2.02	.99	—

1/ Excludes premium pay for overtime and late-shift work.
2/ 63 women at $0.96.

with the problem by evening out production to the degree feasible. The sharing of work has emerged as the principal method of meeting this problem. The general rule under the collective bargaining agreement is that any work to be performed during the slack season shall be divided equally among all the employees. This practice can be successful in an industry such as men's clothing where unemployment is apt to hit all groups of workers equally and direct labor costs are predominately calculated by the piece.

Where employment declines are due to general business conditions, sharing the work is also attempted until take-home pay reaches a minimum level. However, when employment declines persist and grow more serious, this measure is insufficient to cope with the emergency.

In these cases, an unemployment insurance system becomes doubly important. This was first established between management and union in this industry in 1923 in the Chicago market in order to aid workers during the slack seasons. The workers and the employers contributed to the fund in busy seasons, and the workers received compensation from the fund when they lost working time through no fault of their own. The unemployment insurance system, after having proved its success in the Chicago market, was adopted by the New York and Rochester clothing markets in 1929.

This system worked to the advantage of the employers as well as the employees, as the workers in the community receiving some income during a trying period were inclined to remain attached to the industry. As a consequence, the employer gained by not having to find and train new inexperienced workers.

The need for private plans diminished as social legislation was passed. The Federal Social Security Act of 1935 stimulated the general adoption of unemployment compensation laws by several states. The clothing industry's unemployment insurance plan thereupon was discontinued and health and welfare insurance was instituted in its stead.

Another way of making workers more secure against loss of job for long periods is to insure control over the hiring of new workers. The union security clauses, which the union has been able to get accepted throughout the agreements in the industry, require the employers in practice to obtain new workers from the union. The union must be notified of an existing vacancy, and workers may be hired from the open market only if the union is unable to supply them within a specified time -- and even then these workers must join the union within a stated period. This procedure, in effect, gives the union a measure of control over the job market. This is combined with a union policy to obtain the adoption of a share-the-work system if work is scarce.

In addition, clothing workers can expect to lose very little time because of strikes or lock-outs, largely because of the kind of labor-management relations enjoyed. Any disputes concerning agreement interpretation occurring in individual plants must first go through an elaborate grievance procedure with various steps and finally, if they cannot be adjusted at any of these levels, are submitted to arbitration, with the parties bound to accept the award.

Workers in this industry, like millions of other industrial workers, are protected by social insurance effected through legislation. In addition to unemployment insurance discussed above, these benefits encompass old-age and survivors' insurance and employer-financed workmen's compensation established under law by the various States.

Workmen's compensation was the first type of social insurance to be developed extensively in the United States. Such legislation is designed to assure prompt payment of benefits to employees injured on the job or to the dependents of those killed in industry. Currently, more than half the States provide $30 or more (including allowances for dependents) for maximum weekly benefits in temporary disability cases. Payments to beneficiaries in case of death vary by State, some of which continue the payment to the widow for life (or until remarriage), while in the majority of cases such benefits are limited to specified periods or amounts. New York State, where the men's and boys' clothing industry is most heavily concentrated, has adopted the former method and pays up to 66-2/3 percent of the workers' wages (maximum $35 weekly) to his widow and children. For temporary or permanent disability, the worker also receives two-thirds of his wages up to a maximum of $32 weekly.

Old-age and survivors' insurance, to which both employee and employer contribute 1-1/2 percent of the worker's wages, provides retirement income to "covered" workers upon reaching 65 years of age. Recent amendments to this law, which was first enacted in 1935, will make possible payments up to a maximum of $80 monthly to the retired worker and additional benefits to his wife and minor children of up to a combined maximum of $150 monthly.

In addition to these legal provisions, members of the Amalgamated also have obtained retirement programs through collective bargaining negotiations. Retired workers receive benefits of $50 a month in addition to Social Security benefits if they are otherwise eligible in terms of age and length of service, all of which means an average monthly benefit of $100. Although these retirement plans were originally set up by the union, they are part of the collective agreement in the industry. No general legislation covering health insurance exists in this country, except in a few States where only partial protection is provided against wage loss due to non-work-connected disability. Unlike other countries, protection of this type in this country in the past has been primarily the responsibility of the individual or the employer. In order to fill this gap, workers in the men's and boys' clothing industry, through the efforts of their union, have pioneered in obtaining a comprehensive program of employer-financed benefits of this type. In addition to a life insurance benefit of $500 in case of death from any cause, workers have off-the-job protection covering sickness and accidents through cash payments partially covering their wage loss, hospital bills, and surgical and maternity care. In case of sickness or accident, benefits of $20 weekly are payable for up to 13 weeks for sickness and 13 weeks for accident in any 1 year. Should the worker be hospitalized, he receives a daily benefit of $9 for as long as 31 days a year together with a maximum of $200 in case surgery is required.

In addition to the protection offered by this health insurance program, the clothing worker in New York and Philadelphia has at his disposal the services of Sidney Hillman Health Centers. These centers provide low cost comprehensive medical services including general medical examinations, X-rays, diagnosis, all kinds of treatment including physiotherapy, and laboratory and prescription service. During 1951, the first year of operation, more than 160,000 services to 17,000 members were provided. At the present time further health centers are being projected in Rochester, Chicago, Cleveland, and Allentown, Pa.

Union and employers have united to see that workers in this industry enjoy "cradle to the grave" protection.

Other Fruits of Labor

Working conditions, though improved, may not be ideal in many shops: air and lighting could be improved and the work process may not allow for more than the minimum rest to assure efficient work. Yet the 8-hour day affords the men's clothing worker ample opportunity to take advantage of leisure-time pursuits.

The industry's urban concentration places a wide variety of social, educational, and cultural activities at the disposal of the clothing worker. Further, if he wants to learn about the economics of the industry, the history of his and other unions, and wants to understand the political problems of the day, study classes and correspondence courses are available to him through the union, as are all kinds of lectures and cultural events in the city. If he wants to advance in the industry, he can, in the New York market, take advantage of the State-supported Institute of Fashion Design. Also, if he wants to give his children a good education including college to make sure that they will enjoy opportunities beyond the trade in which he has spent all his life, general scholarships are often available to those who qualify, and union-sponsored educational assistance helps to make it possible to achieve this.

In many cases, particularly in New York City, the clothing worker immigrants still prefer living in their own national communities, following old customs, and participating in activities of groups of men and women who came from their own part of the world. Gradually some members of these groups have acquired homes of their own. The union has been interested in improving their housing conditions. Shortly after World War I it began to be active in the cooperative housing movement, and sponsored the building of a series of apartment houses. Though not exclusively occupied by its own members, the Amalgamated has made 1,800 low-rent apartments available through its efforts.

The workers are assisted in building their own homes and in buying all the modern conveniences for making life pleasant, from washing machines and dishwashers to automobiles and television sets. The Amalgamated makes the facilities of credit unions available to its members, but in addition has pioneered in labor banking in New York and Chicago. These banks make small loans and facilitate the granting of larger loans to union members at reasonable interest rates and without burdensome security terms.

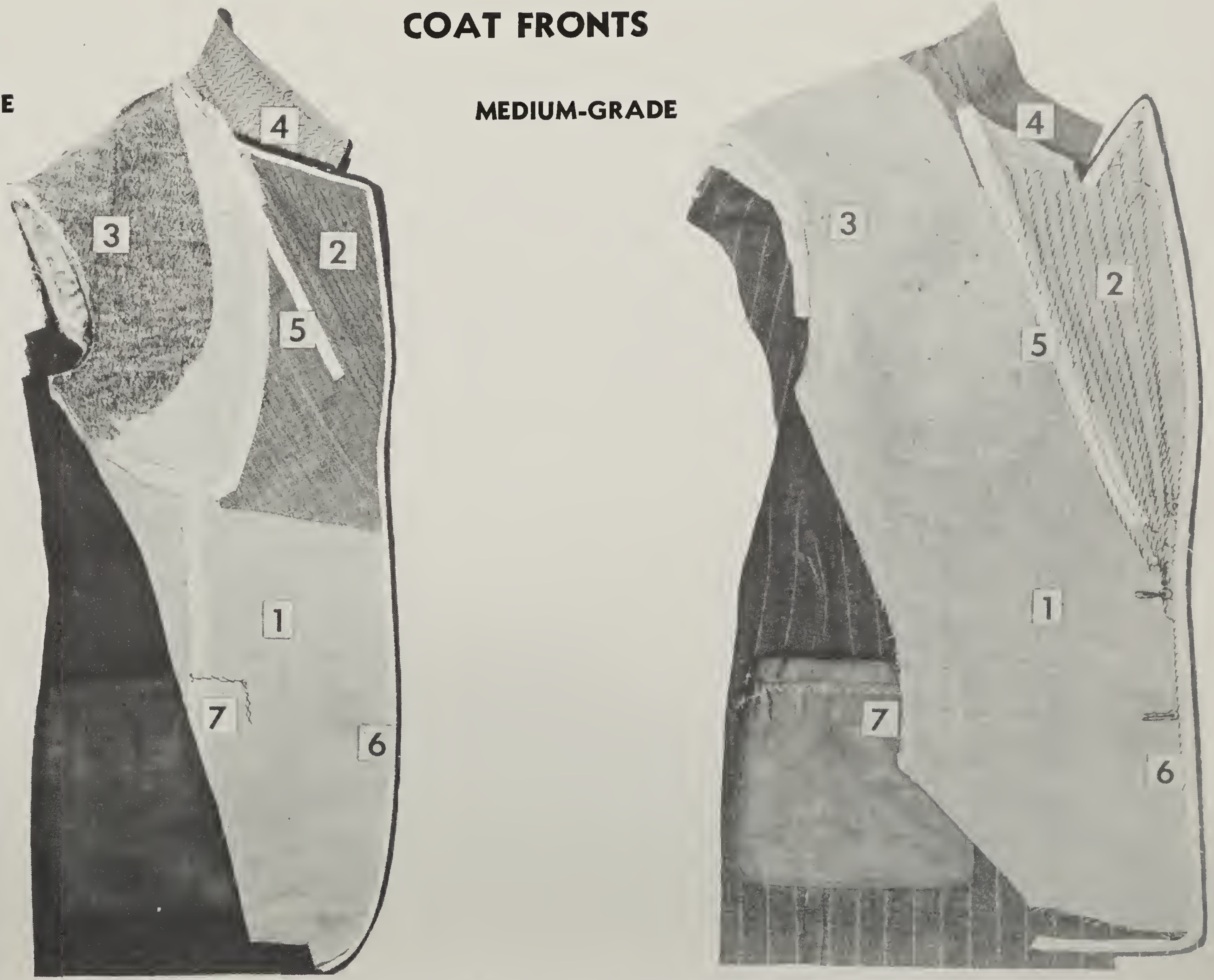
The leisure time of the clothing workers revolves to a large extent around the union as a social center of activities. The union's important role in work relations has given the workers a feeling of participation and achievement. But the union was also able -- or forced, in view of the identity of work group and living community -- to become the center of the workers' free time and recreation. Musical entertainment, play-acting, soft ball teams for children, outings, and other sports such as swimming, hunting, and fishing are only a few of the many diversions arranged. Bowling is perhaps the most popular indoor sport, featured by frequent intercity tournaments and contests. In addition, the workers are directed towards broader political and social goals, and participation in wider community activities such as community hospitals, summer playgrounds, help for the needy, and others. In general, the clothing worker lives a full life off the job.

APPENDIX I: GRADES OF MEN'S WINTER SUITS COMPARED

In the following four illustrations comparisons are made between low, medium, and high grades of men's winter suits. Operations and materials are compared for sack coats, and trousers.

Suits of Three Grades Compared

COAT FRONTS


HIGH-GRADE

MEDIUM-GRADE

Fig. 7 Comparison of high-grade and medium-grade coat fronts.

	HIGH-GRADE	MEDIUM-GRADE	LOW-GRADE
1. INTERFACINGS	High-grade hair canvas or linen—very resistant to creasing. Prevents wrinkled coat fronts.	Lower grade hair canvas has some sizing—not so resistant to creasing.	Burlap or heavily sized cotton, quick to crease and wrinkle.
2. LAPELS	Shaped over the hand as stitched, lapels roll back neatly and will not fall forward.	Closely stitched by machine; firm but not hand-shaped. Lapels likely to fall forward.	Little stitching, no shaping. Lapels will become limp.
3. SHOULDERS	Haircloth under flannelette or thin felt, shaped with hand padding stitches for chest roundness. Lightweight soft cotton pads, securely tacked.	Haircloth plus felt stitched by machine without shaping, lets chest of coat break somewhat. Cotton pads, securely tacked but rather heavy and stiff.	Paper felt, tacked by machine to coat front, gives no shape to chest. Lumpy, badly shaped paper pads, insecurely tacked.
4. COLLAR INTERLINING	High-grade linen, shaped with close hand stitches to undercollar, makes collar turn over smoothly and set close to neck.	Good-quality cotton stitched less closely by machine. No shaping. Corners and edge of collar may turn up.	Heavily sized cotton fastened with few machine stitches to undercollar. Collar will neither turn over smoothly nor set right.
5. BRIDLE-STAY	Hand-stitched along both edges for smoothness. Holds in slight fullness that helps give shape to chest of coat.	Machine instead of hand stitching along both edges. Fullness eased in but not so evenly as in high-grade suit.	Center stitching lets edges curl. No fullness eased in for shaping chest of coat.
6. TAPING	Narrow, thin, pre-shrunk linen tape, hand-stitched along both edges inside edge seam. Thin, soft edge will not pucker or stretch. Armholes taped to hold shape.	Cotton tape stitched in with edge seam and machine-stitched along inner edge. Makes thicker, harder edge on coat. Armholes taped.	Sleazy cotton tape, stitched in with seam, rolls and forms hard, thick edge. Armholes not taped.
7. POCKETS	Ample size, neatly sewed, made of soft, firm, durable silesia. Hand-tacked securely to coat front to protect coat against pull.	Smaller pockets, not so well-stitched or of such firm material. Tacked to front with machine stitches which are less secure and permanent.	Small, badly sewed. Made of sleazy cotton. Not tacked to front.

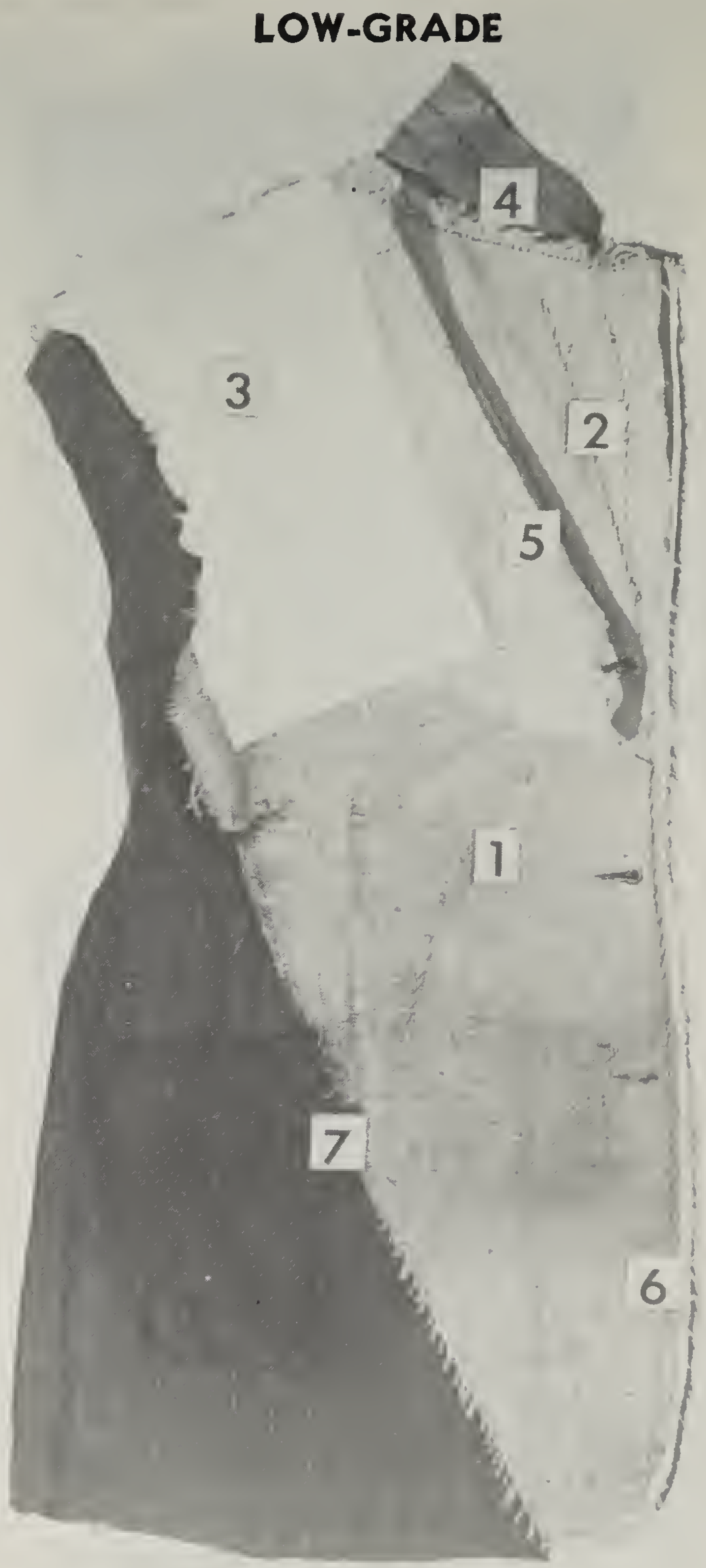


Fig. 8 Low-grade coat front.

TROUSERS

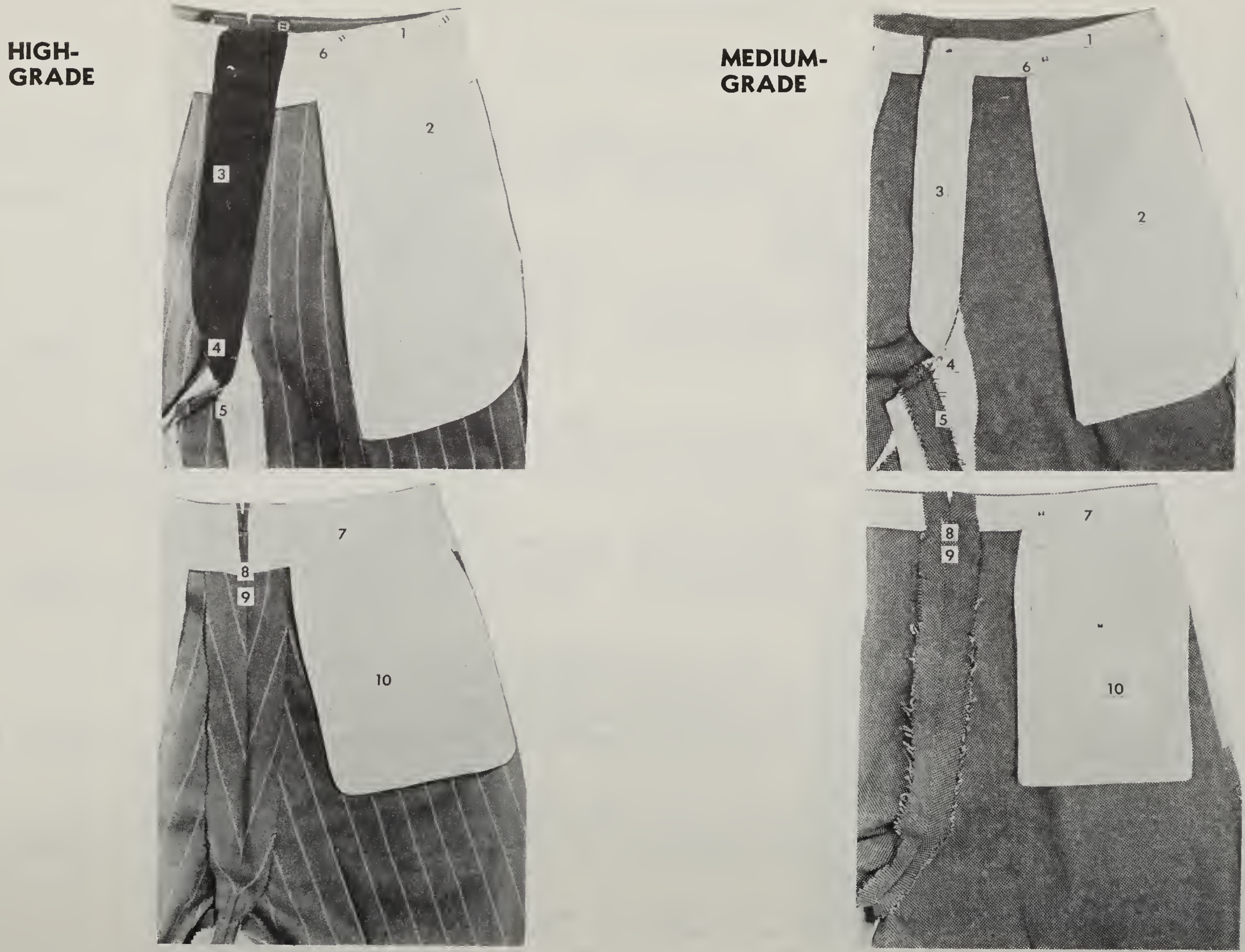


Fig. 9 Comparison of high-grade and medium-grade trousers.

	HIGH-GRADE	MEDIUM-GRADE	LOW-GRADE
1. WAIST-BAND INTERLINING	Firm but soft and comfortable.	Not so soft as in better suit.	Starched, harsh material.
2. POCKETS	Shaped with ample size at bottom, little bulk at waist. Evenly cut, twice-stitched. Smooth, easy to clean inside.	Not so well cut or finished, but twice-stitched. Less room in lower part.	Badly cut and stitched. Often stitched only once—easily ripped.
3. FLY	Facing, bias cut for good fit, extended to make a smooth, strong seam reinforcement for crotch. Zipper closing.	Facing and reinforcement similar to that in high-grade suit, but straight cut. Zipper closing.	Facing straight cut. Not neatly finished, not strong. Button closing. Buttonholes badly worked and weak.
4. CROTCH	No piecings. Crotch reinforced with pocketing material.	Crotch pieced. Reinforcements folded over piecings, making bulk.	Crotch pieced. Skimpy reinforcements of thin cotton.
5. INSEAMS	Ample allowance for letting out.	Small allowance for letting out.	Little or no allowance for letting out.
6. BUTTONS FOR SUSPENDERS	Of good quality, evenly set.	Of good quality, evenly set.	Paper buttons, soon destroyed in cleaning. Unevenly set.
7. WAIST FACING	Hand-hemmed for softness along top edge.	Machine-hemmed—wears well. Not as soft as hand-hemmed.	Machine-hemmed.
8. CENTER BACK	Facing neatly finished by hand over back-rise seam.	Hand stitching holds seam flat against facing at waistline.	Seam stitched after top edge was faced—not flat or comfortable.
9. BACK RISE	Double-stitched for strength. Generous allowance for letting out.	Single but close stitching. Reasonable outlet allowance.	Coarse, single stitching that soon will break. Allowance for letting out is small.
10. POCKETING	Firmly woven, but soft, leathery cotton twill.	Less firmly woven, less durable.	Sleazy, heavily sized cotton. Not durable.

LOW-GRADE

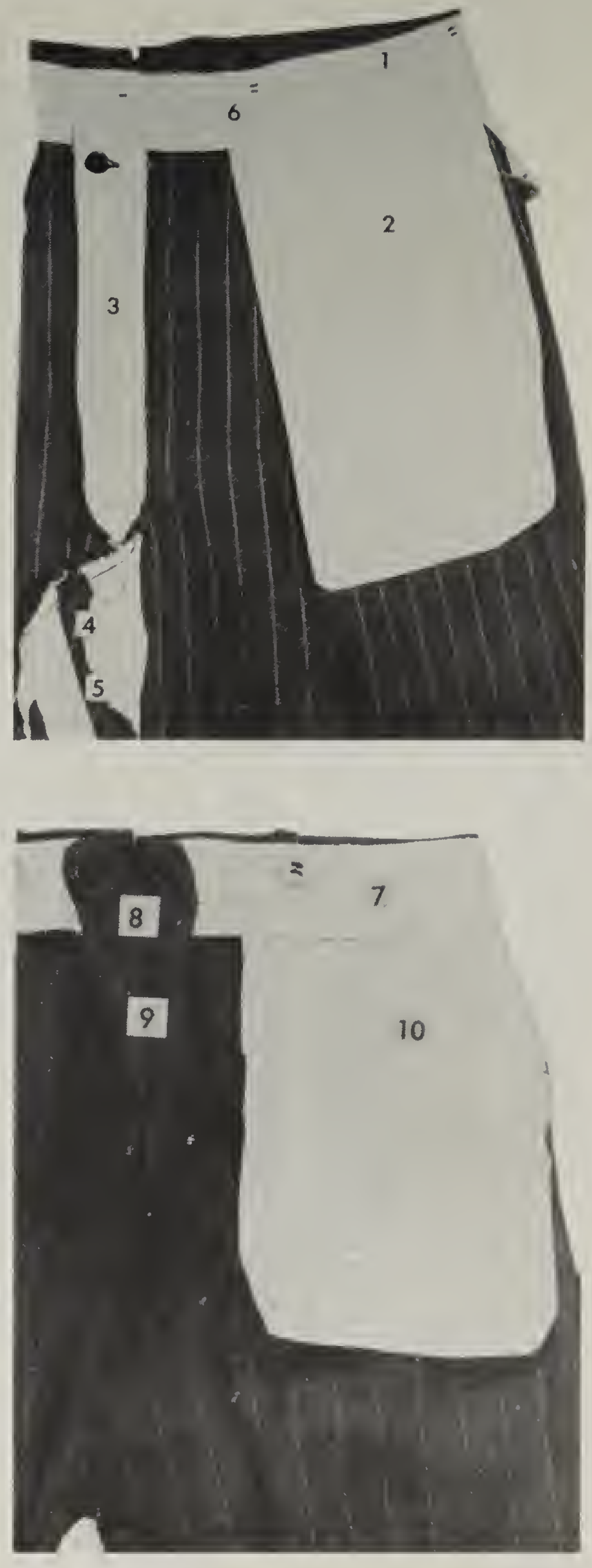


Fig. 10 Low-grade trousers.

APPENDIX II: DATA COLLECTION

Representatives of the Bureau made personal visits to each plant in this study and personally collected the data shown. As mentioned in the text, some adjustments had to be made in the detailed lists of operation because each plant did not perform exactly the same operations, and their sequence may also have differed.

The two questionnaires used to collect the data are reproduced. To reduce their length for reproduction purposes, the space allowed for answering questions has been drastically reduced. Agents were instructed to use additional paper to allow room for comprehensive answers.

Usable answers to all questions were not received from all the plants. Furthermore if the data received did not offer significant information they were not included in this report.

UNITED STATES DEPARTMENT OF LABOR
Bureau of Labor Statistics
Washington 25, D. C.

CONFIDENTIAL

PRODUCTIVITY AND FACTORY PERFORMANCE

MEN'S WINTER SUITS

Name of company ____________________ Address ____________________
Plant name ____________________ Address ____________________
Officials interviewed: Cross out word not applicable.
(Co.)(Plant) ____________________ Title ____________________
(Co.)(Plant) ____________________ Title ____________________
(Co.)(Plant) ____________________ Title ____________________

The data submitted on this schedule will be seen only by sworn employees of the Bureau of Labor Statistics. The data will not be released in any form which permits identification with any specific company, without its written permission.

Survey made by ____________________ Date ____________________

A. SPECIFICATIONS

General Specifications for reported suits. (Select a suit with one pair of pants)

1. Type of sackcoat: Single breasted ___, Double breasted ___. No. of buttons? 1 2 3. Pocket flaps? ___Yes ___no. No. of inside pockets? ____. Other unique styling features: ____________________.
2. Type of vest: Does suit have vest? ___Yes ___no. If yes, does it have the standard four pockets? ___Yes ___no. If other type, specify ____________________.
3. Type of pants: Zipper? ___Yes ___no. Pleats? ___Yes ___no. Waistband: Regular ___, Hollywood style ___.
4. Suit size: ________.
5. Fabric: Type of cloth __________. Pattern; plain ___, striped ___, plaid ___, ply ___, width ___. Quality of lining; low ___, medium ___, high ___. Describe quality of lining: ____________________. Quality; fineness ____, count ____, weight(ry) ____.
6. Factory price line: __________.
7. Grade of garment: ________.
   List features determining grade:
   a. ____________________. d. ____________________.
   b. ____________________. e. ____________________.
   c. ____________________. f. ____________________.

B. PRODUCTION AND MAN-HOURS

1. Reported period:
   a. Select an 8-week period when production of suits was at a high level.
   b. Period begins ____________________, and ends ________________.

2. Factory production and actual man-hours by department:

a. Sackcoats

Department	Production (Units)	Direct man-hours	Indirect man-hours
Cutting			
Making			
Other factory indirect	xxx	xxx	
Total man-hours	xxx		

b. Vests

Department	Production (Units)	Direct man-hours	Indirect man-hours
Cutting			
Making			
Other factory indirect	xxx	xxx	
Total man-hours	xxx		

c. Pants

Department	Production (Units)	Direct man-hours	Indirect man-hours
Cutting			
Making			
Other factory indirect	xxx	xxx	
Total man-hours	xxx		

C. GENERAL FACTORY INFORMATION

1. Company information:
   a. Number of separate plants operated directly by this company_____.
   b. List shops in plant:______.
   c. Do you have a central office (excluding sales) separate from plant?
   ____
   d. Secure company organization, workflow, and layout diagrams or charts if readily available.
   e. Type of establishment: Inside______. Contract______.

2. Purchased parts:

Indicate the approximate proportion (%) of the following parts (findings) or operations used in the manufacture of reported product which are purchased or contracted. If not used in the garment made in this plant, check the final column.

Item	Purchased or contracted out	Not used
Coat fronts		
Trouser waistbands		
Shoulder pads		
Making button holes		
Bridle stays		
Tapes		
Piping		
Other (specify)		

3.

Type of labor	No.	Type of labor	No.
Total plant employment:		Factory indirect workers:	
Factory direct: (Specify labor accounts)		Departmental indirect workers:	
Sponging and shrinking dept.		Sponging & shrinking dept. (Specify)	
Cutting department		Cutting department:	
Making department		Foreman	
		Cutting clerks	
		Floor boys	
		Other	
		Making department:	
		Foreman	
		Bundlemen	
		Other	
		Non-departmental:	
		General maintenance	
		Shipping and receiving clerks	
		Factory porters and guards	
		Machine repairmen	
		Label sewers	
		Final examiners	
		Other	
		Office employees	

4. Material handling equipment:

a. Indicate the number of each type of equipment and where used.

Name	Number	Where used
(1)Hoist		
(2)Conveyors		
(3)Chutes		
(4)Trucks (Canvas, metal, wooden)		
(a) Hand		
(b) Powered		
(5)Freight elevators		
(6)Other equipment		

b. Describe in detail any special material handling equipment or features ____________________ ____________________.

5. Machinery special features:

a. Give examples of means used for repairing or replacing machinery when a breakdown occurs in order to assure continuous operation ____.

b. Plant layout:
Has plant been engineered?___. When was it last engineered?
____________________.

6. Buildings:
   a. One story ____, Multistory ____, Age ____.
   b. Specially designed for men's suits manufacture: Yes ___ no ____.
      If yes, describe: ______________________________________.
   c. Sq. ft. in total plant ____, in production area ____, in storage area ____.
   d. If plant is multistory, on which floors are the departments located? (Describe) ______________________________________.

D. GENERAL FACTORY METHODS

1. Sponging, shrinking, and finishing department operations for men's suits:
   a. If none of this operation is done in plant, is material bought pre-shrunk? _____.
   b. If some or all of this operation is performed in the plant describe briefly: ______________________________________.
2. Cutting department:
   a. Method of marking: Perforated ___, Pattern ___, Photographic ___ Templates ____.
   b. Number of tables ____, length of tables ______________.
   c. Ply per cut when material is cut on the open:

Suit Part	Number of ply per cut		
	Machines	Hand	Die stamped
Suit fabric			
Body lining			
Canvas			
Sleeve lining			
Pocket lining			
Other (list)			

   d. Method of spreading: Hand ____, Machine _____, (Identify machine used) (Name & mfg.) ______________________________
   e. Does the department cut for other plants or contractors?
      Yes ___ no ___: amounts and type of material cut ______________.
   f. Average yardage used per reported suit or number of square inches per suit:
      (1) Cloth ______________________________
      (2) Lining ______________________________
      (3) Canvas ______________________________
   g. Does the company have a holding department for cut work?
      Yes ___ no ___: average amount of cut work in holding department during reported period ______________________________.
3. Making department operations for men's suits:
   a. Type of system used:
      Bundle _____, Section lot _____, Progressive bundle _____, Combination _____, Line _____.
   b. Size of bundle: Average ______, Range ______.
4. Number of operations in each work sub-division:
   a. Sponging, shrinking, finishing _____.

b. Cutting ______.
c. Making ______.

5. Lot sizes and production run practices:
a. Lot size, average _____, minimum ______, maximum ______.
b. Is production based directly on sales estimation ______ or orders received ______?
c. Explain method used to determine amount of material required for a production run: ____.

6. Degree of specialization and merchandising practices:
a. Number of models offered ______.
b. Number of styles offered ______.
c. Range of sizes offered ________.
d. Are the garments retailed under a brand name? Yes ____ no ____.
e. Does the company have any retail outlets? Yes ____ no ____. If yes, how many? ____. Does the company sell all its production through these outlets? Yes ____ no ____.
f. Does the company market its product under franchise agreements? Yes ____ no ____.
g. Does the company alter its product line to satisfy individual customer's orders? Yes ____ no ____.
h. List all other garments manufactured in this plant in addition to men's suits: ____.

7. Inspection:
a. Points of inspection in production process ____________________.
b. System: Describe ____.
c. How are damages handled? Describe ____________________________.
d. Describe inspection of incoming cloth and findings. (omit inspections performed in sponging, shrinking and finishing departments) ____.

8. Production and inventory controls: (Attach all forms used)
a. Determination of incoming material needs. (Describe)___________.
b. Receipt, control, and routing of incoming materials. (Describe)
c. Release of materials for production (Describe) ______________.
d. Describe control of materials and work in process: ___________.
  i. Within each department: ______________________________.
  ii. Between departments: ________________________________.

9. Inventory practices:
a. Finish suit: Average number of suits in stock during the reported period ______.
b. Materials: Yards of goods usually held in stock: Cloth _______ Lining ______ Canvas ______.

10. Lighting:
Check general type of lighting used by department:

Department	Incandescent	Fluorescent	Mercury vapor
Sponging, shrinking, finishing			
Cutting			
Making			

11. Engineering and research:
a. Does this plant have a special department which conducts research for the improvement of its production method? ___________

12. Other factors:
Describe the effect, if any, of other important factors not previously covered which may have accounted for any unusual levels of unit man-hours during period studied.

a. Availability of cloth _____.
b. Style changes _______________.
c. Influence of new types of cloths as rayon, nylon, and mixtures _____.
d. Describe where and how templates are used in making sack coats: ____.

E. FACTORY OPERATIONS

Factory direct man-hours for key operations for specified suit.

1. Sponging, shrinking, and finishing department:
Description of operations:

Operation	Equipment			Type Drive*	No. of operators
	Name, Mfg., & Model	No. of units	Age (yrs) Av. Range		
1. Cloth examining					
2. Testing					
3. Sponging					
4. Others					

2. Cutting department:
Description of operations:

Operation	Equipment				No. of operators	Worker's output; 8-hr. day (suits)
	Name, Mfg. & Model	No. of units	Age (yrs) Av. Range	Type Drive		
1. Spreading a. Mach. b. Hand						
2. Marking						
3. Cutting a. Mach.						
b. Hand						
4. Fitting						
5. Assembling						
6. Ticketing						
7. Others						

Use the following symbols to identify the type of drive: "L" for line shaft, "G" for group drive, and "U" unit drive.

3. Making department for specified sack coat:
a. Description of operations:

Operation	Equipment				No. of operators	Worker's output; 8-hr.day (coats)
	Name, Mfg. & Model	No.of Units	Age(yrs) Av. Range	Type * Drive		
Foreparts: 1.Pipe seams						
2.Sew darts						
3.Tape front armhole fore and shoulder						
4.Press darts						
Pockets:						
5.Make welt						
6.Mark welt						
7.Sew on welt						
8.Piece pocket						
9.Sew on welts						
10.Cut mouth & press open						
11.Finish pockets						
12.Baste pocket mouth						
13.Press pockets						
Backs 14.Pipe seams						
15.Close back seam						
16.Make lining						
17.Press lining						
18.Baste						
19.Pair in back & fore parts						
20.Close side seams						
21.Tape back armhole						
22.Press side back & Armholes						
Fronts: 23.Press canvas						

3. Making department for specified sack coat (continued)

Operations	Equipment				No. of operators	Worker's output; 8-hr.day (coats)
	Name, Mfg. & Model	No.of units	Age(yrs) Av.Range	Type drive		
24.Pair in canvas						.
25.Mark break						.
26.Canvas foreparts						.
27.Baste on bridle						.
28.Pad lapels and bridle						.
29.Press fronts						.
30.Shape						.
31.Cut round canvas						.
32.Pipe bottoms						.
Lining						
33.Piece up lining						.
34.Piece lining pocket						.
35.Make lining pocket						.
36.Sew round lining pocket						.
37.Stitch stay						.
38.Press lining						.
39.Pair in lining with coat						.
40.Baste under						.
41.Sew round						.
42.Fasten tapes						.
43.Press tapes						.
44.Press edge seam open						.

3. Making department for specified sack coat (continued)

Operations	Equipment				No. of operators	Worker's output; 8-hr.day (coats)
	Name, Mfg. & Model	No. of units	Age(yrs.) Av.Range	Type * Drive		
45.Trim facings . .& turn out						.
46.Baste						.
47.Bluff edges						.
48.Fasten . bottoms						.
49.Flat baste . facing						.
50.Baste . lining						.
51.Fasten . facings						.
52.Set edges						.
53.Fell lining side seams . & bottoms						.
54.Trim canvas at armhole, shoulder & . gorge						.
55.Close . shoulders						.
56.Press open . shoulders						.
57.Mark neck . inlay						.
58.Seam under-collar and . canvas						.
59.Press seam						.
60.Pad under-. collar						.
Top-collar						
61.Press & stretch top-. collar						.
62.Shape top-. collar						.
63.Pair in top and under-collar with . coat						.
64.Baste on . under-collar						.

3. Making department for specified sack coat (continued)

Operations	Equipment				No. of operators	Worker's output; 8-hr.day (coats)
	Name, Mfg. & Model	No. of units	Age (yrs) Av. Range	Type Drive		
65. Press in under-collar						
66. Shape under-collar						
67. Fasten bridles and baste						
68. Draw breaks						
69. Fell under collar						
70. Fell collar edge						
Sleeve						
71. Close fore-arm seam						
72. Press fore-arm seam						
73. Tack cuff canvas						
74. Mark & Sew vent						
75. Baste cuff						
76. Press cuff						
77. Sew hind-arm seam						
78. Press hind-arm seam						
Sleeve lining						
79. Close sleeve lining seams						
80. Pair in sleeve lining						
81. Tack sleeve lining to cuff						
82. Baste sleeve lining to cuff						
83. Turn & press sleeve						
84. Pair in sleeves						
85. Sew in sleeves						

3. Making department for specified sack coat (continued)

Operation	Equipment				No. of operators	Worker's output; 8-hr. day (coats)
	Name, Mfg. & Model	No. of units	Age (yrs) Av. Range	Type Drive		
86. Press armhole						
87. Baste armhole and insert pad						
88. Felling						
89. Mark & cut button holes						
90. Make button holes						
91. Pull bastings						
92. Press edges						
93. Press collars & shape						
94. Remove impressions of collar and shapes						
95. Press fronts						
96. Mark & sew buttons						
97. Press elbows						
98. Press sleeves						
99. Press side-seams						
100. Press backs						
101. Press shoulders & armholes						
102. Touch up with hand iron						
103. Roll lapels						

a. Making department for specified sack coat (continued)

b. Are workers in this department on piece rates__, time rates__, other__ (describe)____.

c. Was output per worker calculated from standard time__, actual time__, other?(describe)

d. Describe the method used to obtain worker's output per 8-hour day for this department:

4. Making department for specified vest:

a. Description of operations:

Operation	Equipment				No.of operators	Worker's output; 8-hr.day (vests)
	Name, Mfg. & Model	No.of units	Age (yrs.) Av. Range	Drive *		
Foreparts:						
1.Sew darts						
2.Press darts & welts						
3.Trim welts						
4.Make welts						
5.Sew on welts						
6.Cut open pocket mouth						
7.Press open welt seams						
8.Tack pockets						
9.Sew round welt pockets						
10.Baste canvas by machine						
11.Press foreparts						
12.Trim canvas and shape bottom						
13.Mark shape, assemble lining and front						
14.Baste under by machine						
15.Baste armhole by hand						
16.Join neck and sew tape						
17.Pull bastes and turn vests						
18.Baste edges						
19.Press shoulder pleats						
20.Baste sides and shoulders						

4. Making department for specified vest: (continued)

Operation	Equipment				No.of oper-ators	Worker's output; 8-hr.day (vests)
	Name, Mfg. & Model	No.of units	Age(yrs.) Av.Range	Type Drive*		
21.Trim sides . & shoulders						.
22.Press front . edges						.
23.Join backs . and fronts						.
24.Join sides & . shoulders						.
25.Fell necks						.
26.Remove size . ticket						.
27.Mark button- . holes						.
28.Make button- . holes						.
29.Bar tack, if . machine hole						.
30.Baste backs						.
31.Stitch backs						.
32.Pull bastes . from backs						.
33.Press-off backs						.
34.Press-off . fronts						.
35.Mark for and . count buttons						.
36.Sew on buttons . and tickets						.
37.Brush and . clean						.
Linings 38.Make linings						.
Back 39.Make backs (1st . operation)						.
40.Make backs (2nd operation)						
41.Press backs						.

b. Are workers in this department on piece rate ___, time rate ___, other ___ (describe) _____.

c. Was output per worker calculated from standard time ___, actual time ___, other?(describe) _____.

d. Describe the method used to obtain workers output per 8-hour day in this department: ________________________.

5. Making department for specified pants:

a. Description of operations:

Operation	Equipment				No. of operators	Worker's output; 8-hr. day (pants)
	Name, Mfg. & Model	No. of units	Age (yrs.) Av. Range	Type Drive		
1. Serge in & out leg seams & fork run, taking in fork stay						
2. Sew in pleats						
3. Press pleats						
4. Sew on pocket facing, turning in; (Bottom of facing shaped)						
5. Sew pockets & facing to front; nick seam at both ends of stitching						
6. Turn back, pipe, turn in & sew down inside edge of pocket facing						
7. Sew pocket, tack mouth top & bottom nick facing of pocet below bottom; tack & pair off surplus facing at top						
8. Sew zip to left fly on twin needle taking in lining; sew right fly to zip						
9. Trim zip level with top of fly; sew jean stay to left fly top						
10. Sew fly lining to right fly.						
11. Nick front for fly; sew left fly to front						
Backs 12. Serge in & cut leg seams, taking in pocket stay on side seam; serge seat seam.						

5. Making department for specified pants, (continued)

Operation	Equipment				No. of operators	Worker's output; 8-hr. day (pants)
	Name, Mfg. & Model	No. of units	Age (yrs.) Av. Range	Type Drive		
13. Sew darts						
14. Press darts						
15. Mark hip pockets						
16. Lay pocket, back & facing with drilled holes in pocketing in line with hip pocket mark; sew across on twin needle m/c with knife between needles cutting as sewing						
17. Make bottom welt; turn in facing & sew down in pocket						
18. Sew each side of pocket, using knife trimmer						
19. Turn out hip pocket; catch ends; insert tab on left hip only; loop for button						
20. Mark & sew button to hip pocket (L)						
21. Sew round hip pocket						
22. Pair in backs & fronts insert garment ticket in hip pocket						
23. Close side seams from top to bottom						
24. Make belt loops for waist band						
25. Sew on waistband including 6 or 7 belt loops						

5. Making department for specified pants, (continued)

Operation	Equipment				No. of operators	Worker's output; 8-hr. day (pants)
	Name, Mfg. & Model	No. of units	Age (yrs.) Av. Range	Type Drive		
26. Press open seam at pocket mouth, turn over & press down lip of pocket, press waistband seam, press over right fly seam, press back left fly						
27. Bar-tack loops on waistband, side pocket, hip pockets						
28. Sew round side pocket; close pocket to stay						
29. Serge left fly						
30. Make watch pocket by serging machine						
31. Sew on watch pocket to top of waistband						
32. Put in snaps on waistband						
33. Corner left and right flys.						
34. Fell on waistband lining						
35. Sew side of watch pocket to waistband lining						
36. Sew on edge of right fly to waistband lining						
37. Press waistband lining & press seam of right fly lining						
38. Stitch left fly						
39. Check waist measure						
40. Sew back seam, beginning 3 in. from crotch & make vent						
41. Sew on 6 suspender buttons, inserting button stay to each						

5. Making department for specified pants (continued)

Operation	Equipment				No. of operators	Worker's output; 8-hr. day (pants)
	Name, Mfg. & Model	No. of units	Age (yrs.) Av. Range	Type Drive		
42. Stitch down waistband lining & close right fly edge						
43. Bar-tack loops through waistband						
44. Close in-leg seams						
45. Close crotch seam						
46. Put on zip runner & staple end of zip						
47. Tape crotch						
48. Bar-tack fly						
49. Press side seam, in-leg seams, and back seams						
50. Clean, sew on tickets & remove Sonbar tickets						
51. Press legs						
52. Press round top						
53. Pink bottoms						
54. Examine and clean stains						

b. Are workers in this department on piece rate?__, time rate?___, other?___ (describe)______.

c. Was output per worker calculated from standard time?__, actual? ______, other? (describe) ______.

d. Describe the method used to obtain worker's output per 8-hour day in this department: ______.

6. Do any operators in any of the departments use two or more machines as part of their regular operations? Yes___No ___. If yes, give operation numbers as on pages 5 to 11 and describe: __________.

UNITED STATES DEPARTMENT OF LABOR
Bureau of Labor Statistics
Washington 25, D. C.

CONFIDENTIAL

PRODUCTIVITY AND FACTORY PERFORMANCE

MEN'S TOP COATS

Name of company________________________Address____________________________
Plant name____________________________Address____________________________
Officials interviewed: (Cross out word not applicable.)
(Co.) (Plant)________________________Title______________________________
(Co.) (Plant)________________________Title______________________________
(Co.) (Plant)________________________Title______________________________

The data submitted on this schedule will be seen only by sworn employees of the Bureau of Labor Statistics. The data will not be released in any form which permits identification with any specific company, without its written permission.

Survey made by________________________________Date______________________

A. SPECIFICATIONS

General Specifications for Topcoat Reported

1. Type of topcoat: Single breasted___Double breasted_____.
   No. of buttons_____1____2_____3
2. Pockets: No. of outside pockets_______________.
   Style of outside pockets: slash____flap____
   No. of inside pockets____________.
3. Fabric: Type of cloth____________________________________
   Pattern; plain_____, striped_____, plaid_____.
   Quality: Fineness_____, count_____, weight (running yds.)______, ply_____.
   Width___________________
   Quality of lining; low___, medium____, high_____.
   Describe quality:_______________________________________
4. Other unique styling features: ________________________________
5. Factory price line: ____________________________________.
6. Grade of garment: _____________________________________.
   List features determining grade:
   a.______________________________d._______________________________
   b.______________________________e._______________________________
   c.______________________________f._______________________________
7. Topcoat size: ____.

B. PRODUCTION AND MAN-HOURS

1. Instructions:
   - a. Select an eight week period when production of topcoats was at a high level.
   - b. Indicate dates for period reported: From __________ to __________

2. Factory production and man-hours by department:

Department	Production (units)	Direct man-hours	Indirect man-hours
Cutting			
Making			
Other factory indirect			
Total man-hours			

C. GENERAL FACTORY INFORMATION

1. Employment in the entire plant during the last pay period within the reported period:

Type of Labor	No.	Type of Labor	No.
a. Factory direct labor:		(2) Non-departmental Indirect Labor:	
(1) Sponging & shrinking dept.	___	(a) General maintenance	___
(2) Cutting department	___	(b) Shipping & receiving clerks	___
(3) Making department	___	(c) Factory porters	___
b. Factory indirect labor:		(d) Machine repairmen	___
(1) Departmental indirect labor:		(e) Guards (watchmen)	___
(a) Sponging & shrinking dept	___	(f) Label sewers	___
(specify) __________	___	(g) Final examiners	___
(b) Cutting department:		(h) Others	___
1. Foremen	___	c. Office Employees	___
2. Cutting clerks	___	d. Total employees in this plant	___
3. Floor boys	___		
4. Others	___		
(c) Making department:			
1. Foremen	___		
2. Bundleboys	___		
3. Others	___		

2. Machinery special features:
   - a. Give examples of means used to assure continuous operation while repairing or replacing broken machinery. __________
   - b. Describe safety devices and indicate places and machines where they are used: __________

3. Company information:
   - a. Number of separate plants operated directly by this company_________
   - b. Number of shops in this plant__________
   - c. Do you have a central office (excluding sales) separate from plant___
   - d. Secure company organization, workflow, and layout diagrams or charts, if readily available.
   - e. Type of establishment: Inside___________Contract____________

4. Parts purchased:

   For the following parts (findings) or operations, note the percent purchases or contracted or check if not used in the garment made in this plant:

Parts	Purchased (%) (or contracted out)	Not used (check)
(1)Coat fronts		
(2)Shoulder pads		
(3)Making button holes		
(4)Bridle stays		
(5)Tapes		
(6)Others		

5. Material handling equipment:
   - a. Indicate the number of each type of equipment and where used.

Equipment	Number	Where used
(1)Hoist		
(2)Conveyors		
(3)Chutes		
(4)Trucks (canvas, metal, wooden)		
(a)Hand		
(b)Powered		
(5)Freight elevators		
(6)Other equipment		

   - b. Describe in detail any special material handling equipment or features.______________________________

6. Plant Layout:
   - a. Has plant been engineered?_____. When was it last engineered?_______ Describe major improvements introduced as a result of last plant engineering:

7. Buildings:
   a. One story_____, Multistory_______, age_________.
   b. Specially designed for reported product manufacture: Yes___no___. If yes, describe:____________________
   c. Sq. ft. in total plant____________, in production area__________, in storage area__________________.
   d. If plant is multistory, on which floors are the departments located: (Describe)____________________

D. GENERAL FACTORY METHODS

1. Sponging, shrinking, and finishing department operations for topcoats.
   a. If none of this operation is done in plant, is material bought preshrunk?________________________
   b. If some or all of this operation is performed in the plant, describe the process briefly.____________________

2. Cutting department operations for topcoats.
   a. Ply per cut when material is cut on the open.

Topcoat Part	Number of ply per cut		
	Machine	Hand	Die stamped
Topcoat fabric			
Body lining			
Canvas			
Sleeve lining			
Pocket lining			
Other (list)			

   b. Number of tables___________, length of tables_______________.
   c. Method of marking, perforated_____, pattern______, photographic______, templates _________
   d. Does the department cut for other plants or contractors? Yes___no___; amounts and type of material cut____________________
   e. Average yardage used per reported topcoat or number of square inches per topcoat.
      i. Cloth___________
      ii. Lining__________
      iii. Canvas___________
   f. Does the company have a holding department for cut work?________When and how much cut work is held?____________________

3. Making department operations for topcoats.
   Type of system used.
   Bundle_________, Section lot_________, Progressive bundle___________.
   Combination_______________, line______________.

4. Number of operations in each work sub-division.
   a. Sponging, shrinking, finishing____________.
   b. Cutting________________.
   c. Making_________________.

5. Lot sizes and production run practices.

a. Lot size average_________, minimum________, maximum________.

b. Is production based directly on sales estimates____, or on orders received?____

c. Explain method used to determine amount of material required for a production run.______________________________________

6. Degree of specialization and merchandising practices.

a. Number of styles offered___________, number of models___________.

b. Range of sizes, from ______________ to______________.

c. Are the garments retailed under a brand name? Yes___no____.

d. Does the company have any retail outlets? Yes___no___. If yes, how many_____. Does the company sell all its production through these outlets? Yes____ no____.

e. Does the company market its product under franchise agreements? Yes_____no______.

f. Does the company alter its product line to satisfy individual customers order? Yes_____no_____.

g. List all other garments manufactured in addition to men's topcoats.

____

7. Quality control.

a. Points of inspection in production process_________________________

b. System: Describe____

c. How are damages handled? (Describe)_________________________________

d. Describe inspection of incoming cloth and findings. (Omit inspections performed in sponging, shrinking, and finishing department)___

____

8. Production and inventory controls. Attach all forms used:

a. Determination of incoming material needs. (Describe)______________

b. Receipt, control, and routing of incoming material. (Describe)_____

c. Release of materials for production. (Describe)____________________

d. Describe control of materials and work in process:

i. Within each department____

ii. Between departments____

9. Inventory Practices.

a. Finished goods: Average number of units in stock during the reported period___________________.

b. Materials: Quantity of piece goods usually held in stock during the reported period_________________.

10. Lighting:

Check general type of lighting used by department:

Department	Incandescent	Flourescent	Mercury vapor
Sponging, shrinking, finishing			
Cutting			
Making			

11. Describe where and how templates are used in making topcoats.________

E. FACTORY OPERATION

Factory direct man-hours for key operations for specified topcoat.

1. Sponging, shrinking, and finishing department.

a.____

Operation	Equipment					No. of operators
	Name and Manufacturer of Machine	Model no.	Age	Drive*	No.	
Cloth examining						
Testing						
Sponging						
Other (specify)						

b. Output per 8-hour day in pounds or yards of cloth (specify unit)___

c. Are workers in this department on piece rate____, time rate_____, other (Describe)______________________________

d. Was output per 8-hour day calculated from standard time_____, actual time______, other____(Describe)____________________

e. Describe the method used to obtain data on output per 8-hour day in this department:______________________________

2. Cutting department:

a.____

Operation	Equipment				No. of operators	Worker's Output per 8-hr. day
	Name and Manufacturer of Machine	Model No.	Age	No.		No. of Topcoats
Spreading						
Marking						
Machine Cutting						
Hand Cutting						
Die Cutting						
Fitting						
Assembling						
Ticketing						
Others						

b. Are workers in this department on piece rate_____, or time_________?

c. Was output per worker calculated from standard time_____, actual time________, other____(Describe)____________________

d. Describe the method used to obtain data on output per 8-hour day in this department:______________________________

3. Making Department for specified topcoat.

a. ______

Operation	Equipment					No. of operators	Worker's Output per 8-hr. day
	Name of machine	Model No.	Age	Drive *	No.		
PANTS 1. Line, turn, & gauge stitch cuffs							
2. Press cuffs							
3. Canvas make							
4. Set label to yoke (lining)							
5. Face lining pocket, setting size ticket & union label							
6. Pipe inside pocket slash							
7 Make inside pocket (complete)							
8. Join & bottom hem back lining							
9. Face & set lining to side pockets (2)							
10. Pipe side pockets							
SLEEVES 11. Outseam sleeves & linings							
12. Baste cuffs to sleeves							
13. Stitch cuffs							
14. Join sleeve & lining at cuff ends							
15. Inseam sleeves & linings							
16. Press seams							
17. Tack lining to sleeves & turn							

3.Making department for specified topcoat (continued)

Operation	Equipment					No. of operators	Worker's Output per 8-hr. day
	Name of machine	Model No.	Age	Drive *	No.		
SLEEVES--Con.							
18.Sew buttons at cuffs							
19.Trim sleeve linings							
20.Inspect							
UNDERCOLLAR							
21.Piece undercollar canvas							
22.Piece undercollar							
23.Press seams							
24.Stitch undercollar							
25.Blind stitch undercollar							
26.Trim undercollar canvas.							
27.Collar shaping							
COLLAR							
28.Join collar to undercollar							
29.Trim & turn							
30.Gauge stitch							
FRONTS							
31.Join facings to yoke facing							
32.Pipe front facing & yoke							
33.Pipe fronts							
34.Set pockets welts & slash							
35.Pipe pocket openings							
36.Set pockets & edge-stitch welts							
37.Set bellows to facings							
BACKS							
38.Pipe (right) center back							
39.Pipe left vent							

3.Making department for specified topcoat (continued)

Operation	Equipment					No. of operators	Worker's Output per 8-hr. day
	Name of machine	Model No.	Age	Drive*	No.		
BACKS--Con. 40.Tape & gauge stitch left vent							
41.Sew lining to right vent							
42.Center seam back & tack vent							
43.Press lining (vent)							
44.Finish vent lining & hem							
ASSEMBLY 45.Match fronts & backs							
46.Side seam coat							
47.Raise stitch seams							
48.Press seams							
49.Baste canvas front							
50.Pad lapel							
51.Shape front							
52.Trim canvas							
53.Baste facing to front (1st)							
54.Tape front							
55.Blind stitch tape							
56.Press tape							
57.Pipe bottom							
58.Pull basting from facings							
59.Baste edges & bottom							
60.Second baste							
61.Stitch facings & lining							
62.Baste lining							
63.Blind stitch lining							
64.Fell facings, bottom & vent							

3. Making department for specified topcoat (continued)

Operation	Equipment					No. of operators	Worker's Output per 8-hr. day
	Name of machine	Model No.	Age	Drive *	No.		
ASSEMBLY--Con.							
65. Mark for buttonholes							
66. Make buttonholes							
67. Make lapel buttonhole							
68. Tack buttonholes							
69. Join & trim shoulder & tape							
70. Pair-in sleeves							
71. Set sleeves							
72. Press shoulders (armholes)							
73. Raise stitch armholes							
74. Armhole baste							
75. Join shoulder lining							
76. Sew armhole & shoulder linings							
77. Tack & trim armholes							
78. Trim collar & neck							
79. Set collar to lapels							
80. Collar baste							
81. Finishers							
82. Edgestitch							
83. Remove bastings							
84. Press & form collar							
85. Press edges, collar, lapels & cuffs							
86. Press sleeves & body							
87. Mark for button							
88. Sew button							

Operation	Equipment					No. of operators	Worker's Output per 8-hr. day
	Name of machine	Model No.	Age	Drive*	No.		
ASSEMBLY-Con. 89. Clean & inspect coat							
90. Bush (repair)							

* Use the following symbols to identify the type of drive: "L" for line shaft; "G" for group drive, and "U" for unit drive.

b. Are workers in this department on piece rate____, or time?____

c. Was output per worker calculated from standard time_____, actual time_____, other_____. Describe:____________________

d. Describe the method used to obtain data on output per 8-hour day in this department:

4. Do any operators in any of the departments use two or more machines as a part of their regular operations? Yes___no____. If yes, give operation numbers as on pages 7 through 10____________________

APPENDIX III: TOPCOAT FABRICS IN GENERAL USE

Sharkskin:	A worsted twill suiting, neat looking, sturdy, and practical. Light and dark yarns are alternated lengthwise and crosswise. Sharkskin comes plain, striped or patterned.
Gabardine:	A hard, smooth-finished worsted. The weave is very steep twill. The fabric is hard wearing, holds a crease, but gets shiny with wear and cleaning. Colors are solid.
Covert:	May be either worsted or woolen, but in suitings woolen covert is most used. The weave is steep twill similar to gabardine but is much coarser looking and is covered with soft smooth nap.
Flannel:	May be woolen or worsted, or a combination of woolen and worsted yarns. Woolen flannel has a thick surface nap that almost hides the weave. Worsted flannel is finer and not so thick and heavily napped as woolen.
Cheviot:	Worsted cheviot is soft, semifinished, twill variation, with more nap than semifinished serge. It is substantial, hard wearing, does not get shiny. Woolen cheviots are harsher and coarser than worsted.
Tweed:	Is rough, bulky, woolen twill made of coarse, wiry, long fibers. Lengthwise yarns are white; crosswise, colored. Best qualities are made of high-grade, new wool with tightly twisted yarns, making excellent wearing cloth.
Shetland:	True shetland looks like high-grade tweed but is a softer, lighter weight, and looser woven woolen. It wears well, but because of the loose weave it has lots of give and cannot be expected to keep its shape or press.

GLOSSARY

Bartack:	To reinforce openings or junctions such as pockets, flys, and belt loops with a series of short, close, perpendicular stitches (lockstitch) to prevent tearing.
Book seams:	Seams which are not bound with piping, but are turned under. Approximately one inch more fabric is required for this type of seam.
Buck:	The padded and cloth-covered part of a press on which garments are placed for pressing, usually designed for a special purpose.
Coat front:	The part of a sack coat found between the lining and cloth which gives body to the garment.
Fell:	1. Hand operation: to permanently stitch a seam, one edge of which is folded over the other to conceal raw edges. Used in collar operations. 2. Machine operation: same operation performed on a double-needle sewing machine.
Fitting:	Preparing cut parts for making by marking locations for buttonholes, buttons, pockets, belt loops, etc., with the aid of templates, chalk, and yarn; cutting additional small parts; trimming cut parts when necessary; and matching backs and foreparts, sleeve linings with sleeves, etc.
Gabardine:	A hard, smooth-finished, tightly woven worsted with a steep twill weave.
Lay:	A predetermined number of plys of cloth spread on a long cutting table, from which identical parts are cut simultaneously.
Making:	All sewing and pressing operations in the manufacture of a suit.

Marking:	Indicating the outlines of the various parts of the garment to be cut with soap chalk on the top of a lay using heavy paper patterns as guides.
Model:	The design of a garment such as a three button single-breasted sack coat.
Piece goods:	Finished cloth in bolts from about 36 to 130 yards long.
Piping:	A narrow bias tape used to bind seams.
Ply:	1. Cloth: the number of thicknesses of cloth in a lay. 2. Thread: the number of strands or single ends in the yarn from which the fabric is woven.
Running yard:	A yard measured the length of the fabric regardless of width.
Serge:	1. Sewing operation: to sew the edge of a garment with an overedge stitch which binds the fabric, preventing fraying. Used for trouser seams. 2. Cloth: a hard-finished, unnapped worsted with a close diagonal twill weave.
Sharkskin:	A worsted twill weave, the light and dark yarns of which are alternated lengthwise and crosswise.
Shop:	A sub-division of the making department; as pants shop, sack coat shops, etc.
Silesia:	A low quality cotton twill cloth with a smooth, glossy finish, used for pocket lining.
Sized cotton:	Cotton yarn which has been specially processed to lay down the projecting fibers and give the cloth more body and weight. Used for pocketing and coat fronts.

Spreading:	Laying cloth back and forth by hand or mechanical device on a cutting table. *Open-fold in the lay* - Spreading the material with the ends open. *Closed-fold in the lay* - Spreading the material without cutting the ends or side where the fabric comes double-rolled in the bolt.
Style:	Different kind and color of fabric from which suits are made.
Swatch:	A sample piece of cloth.
Thread count:	The number of threads per square inch of woven fabric.
Topcoat:	A light-weight outer or overcoat. Topcoating fabrics weigh from 14 to 20 oz. per yard of cloth 54 inches wide.
Trimmings:	Parts of a suit other than the suit fabric such as coat fronts, linings, and shoulder pads.
Twill:	A fabric with a diagonal weave, e.g., serges and drills.
Under-press:	To press the underside of a garment during its construction for the purpose of opening seams and shaping. This greatly facilitates subsequent sewing operations, and improves the appearance of the finished garment.
Woolen:	A fabric that is coarser worsted. Typical woolen fabrics are tweeds, homespuns, and twists.
Worsted:	Cloth made from worsted yarn. Long wool fibers are combed parallel and twisted into strands, two or more of which are then twisted into yarn. Some of the worsteds used are gabardine, serge, and sharkskin.

Illustrations courtesy of:

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BLS Report No.5

Employment in Metalworking Industries

by SIZE of FIRM

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October 1951 to October 1952

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

Employment in Metalworking Industries

by SIZE of FIRM

Quarterly Employment in Selected Metalworking Industries By Size Class of Establishment

October 1951 to October 1952

UNITED STATES DEPARTMENT OF LABOR
Martin P. Durkin - Secretary

BUREAU OF LABOR STATISTICS
Ewan Clague - Commissioner

WASHINGTON 25, D.C.
MARCH 1953

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Prepared by
DIVISION OF MANPOWER AND EMPLOYMENT STATISTICS
Seymour L. Wolfbein, Chief

EXPLANATORY NOTE

One of the notable gaps in the structure of our economic statistics is the lack of employment, hours and earnings information by size class of establishment. Relative employment changes among small and large businesses are of great interest and economic significance in peacetime; information of this kind is all the more vital during periods of national emergency when employment changes are carefully watched as indicators of needed industrial expansion.

At the request of the Defense Production Administration and the National Production Authority, the Bureau of Labor Statistics has developed an employment series by size class of establishment for selected metalworking industries. These data are required by the defense agencies at this time to measure the effect of materials allocation on employment and for various operating determinations.

Data Published

This, the fourth in a series of employment estimates for selected metalworking industries by size class of establishment, covers the period from October 1951 to October 1952. Subsequent publications to be issued quarterly will contain similar data for later quarters. Estimates are available for the following major industry groups: fabricated metal products; machinery (except electrical); electrical machinery, equipment and supplies; and transportation equipment. Data are also published for a majority of industry groups in these major industries. [1] Estimates for each published series are prepared for four size classes: 0-99; 100-249; 250-499; and 500 and over. The sum of the size classes in the industry cells add to the production-worker total industry estimates for January 1952 and as such are consistent with BLS employment estimates published in the Employment and Payrolls Monthly Statistical Report.

Preparation of Estimates

The employment statistics presented in this report were prepared from information furnished by metalworking establishments on the regular BLS monthly schedule, Confidential Report on Employment, Payrolls, and Hours (BLS 790-C).

The sample for the 0-99 size class was derived from the 1947 Census of Manufactures and supplemented by data from the 1950 Annual Survey of Manufactures and the Bureau of Old-Age and Survivors Insurance. Establishments in this group were classified industrially by the Census Bureau in accordance with the Standard Industrial Classification Code.

For the remaining size classes BLS attempted to obtain schedules from every employer in each of the industries covered. To obtain complete coverage BLS supplemented its 1950 employment sample with reports for establishments which previously had not reported. In this group, establishments were classified by BLS and cooperating State agencies under the same SIC code. For all reporters in the sample, the size of establishment is measured by the average number of workers employed in 1950.

---

[1] Industries and size classes for which estimates are not available are indicated in footnotes to the tables; industries 375 and 379 are combined.

The April, July, and October 1952 estimates were projected from employment levels of January 1952 production worker estimates published in the May 1952 Employment and Payrolls Monthly Statistical Report.

Since the January levels were total industry estimates it was necessary to stratify these data by size. This was done in the following manner:

1. To derive the 0-99 size class estimate each industry sample class cell within the size class was multiplied by the appropriate sample inflation factor. The products were then summed to derive the industry estimate for this size class. The estimates for this size class for July and October 1951 and April, July, and October 1952 were prepared in the same manner. All establishments of multi-unit concerns were excluded from this smallest size class and included in the next larger size class.

2. The January 0-99 size class estimate was then subtracted from the published January 1952 production worker figure. A set of employment estimates for the 100-249, the 250-499 and the 500 and over size classes was prepared for January 1952 by projecting Census 1947 data. The percentage which each of these size classes was of the total was then applied to the residue of the January 1952 published estimates after the 0-99 size class employment was subtracted. To obtain October and July 1951 estimates by size each of the January size class estimates beginning with the 100-249 group was "linked" back to October and then to July 1951 by means of the BLS sample which was used to project the Census 1947 data (mentioned above) from July 1951 to January 1952. The April, July, and October 1952 estimates were prepared by the same "link" method.

The "all employee" estimate for the 0-99 size class was derived by applying the inflation factor to the "all employee" data for each industry sample class cell. For the other size classes the ratio of "production-worker employees" to "all employees" were computed from the production-worker/all employee samples for each size class in each quarter. The estimates were obtained by dividing the production-workers estimate by these ratios.

Comparability and Reliability

Data contained in this publication are consistent with those published in the Employment and Payrolls Monthly Statistical Report. For SIC industries 34-37, estimates in this publication are a revision of those in Employment and Payrolls. When bench-mark adjustments are made the revision will be incorporated into the historical series.

A discussion of the reliability of the estimating process is contained in the appendix.

Table 1 - Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Total, selected metalworking industries (34-37)	5,326,922	4,895,802	5,184,581	5,111,197	5,020,723
0 - 99	727,195	685,296	690,601	685,797	683,154
100 - 249	558,558	529,021	544,913	542,978	530,062
250 - 499	596,446	556,623	578,061	573,070	566,652
500 and over	3,444,723	3,124,862	3,371,006	3,309,352	3,240,855
Fabricated metal products (except ordnance, machinery, and transportation equipment)	1,031,958	915,199	988,073	983,044	1,005,234
0 - 99	271,498	251,470	256,670	254,603	266,585
100 - 249	189,476	174,125	182,520	183,692	184,819
250 - 499	168,785	152,102	161,084	160,804	162,118
500 and over	402,199	337,502	387,799	383,945	391,712
Tin cans and other tinware	49,131	48,529	46,315	44,576	49,067
0 - 99	(1/)	(1/)	(1/)	(1/)	(1/)
100 - 249	9,439	9,773	8,818	8,494	9,734
250 - 499	14,535	14,390	13,113	12,985	15,073
500 and over	24,155	23,345	23,383	22,135	23,245
Cutlery, hand tools, and hardware	147,544	132,138	147,319	150,147	151,369
0 - 99	25,523	23,807	25,224	26,466	26,180
100 - 249	25,033	23,583	25,789	26,000	25,483
250 - 499	25,426	23,815	25,662	25,983	25,834
500 and over	71,562	60,933	70,644	71,698	73,872
Heating apparatus (except electric) and plumbers' supplies	161,584	141,941	145,987	144,730	150,316
0 - 99	16,521	15,250	16,020	16,651	16,586
100 - 249	33,171	29,641	28,316	28,377	30,301
250 - 499	31,822	27,815	27,889	27,549	27,081
500 and over	80,070	69,235	73,762	72,153	76,348
Fabricated structural metal products	249,257	217,538	240,286	240,746	243,356
0 - 99	83,356	79,349	77,544	78,897	85,222
100 - 249	53,383	49,888	53,046	52,392	51,642
250 - 499	35,871	32,295	35,049	35,036	34,442
500 and over	76,647	56,006	74,647	74,421	72,050

See footnotes at end of table.

Table 1 - Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly October 1952 - October 1951 - Continued

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Metal stamping, coating, and engraving------------------------	184,656	160,786	171,381	168,097	174,301
0 - 99---------------	67,464	61,083	63,156	61,737	66,335
100 - 249---------------	24,439	22,077	23,600	23,865	23,499
250 - 499---------------	18,978	16,277	17,965	17,800	18,189
500 and over------------	73,775	61,349	66,660	64,695	66,278
Lighting fixtures-----------------	48,829	44,370	45,566	46,124	49,203
0 - 99---------------	19,366	16,839	16,833	16,709	18,717
100 - 249---------------	7,813	7,032	7,084	7,512	7,663
250 - 499---------------	4,649	4,396	4,772	4,798	5,281
500 and over------------	17,001	16,103	16,877	17,105	17,542
Fabricated wire products----------	64,886	55,328	65,229	62,874	64,412
0 - 99---------------	22,196	21,121	21,912	19,933	20,258
100 - 249---------------	11,162	9,394	11,038	11,174	11,202
250 - 499---------------	11,565	9,296	10,977	11,586	11,755
500 and over------------	19,963	15,517	21,302	20,181	21,197
Miscellaneous fabricated metal products-------------------------	126,071	114,569	125,990	125,750	123,210
0 - 99---------------	36,070	33,000	34,980	33,248	32,272
100 - 249---------------	25,036	22,737	24,829	25,878	25,295
250 - 499---------------	25,939	23,818	25,657	25,067	24,463
500 and over------------	39,026	35,014	40,524	41,557	41,180
Machinery (except electrical)------	1,573,543	1,571,124	1,651,161	1,637,401	1,598,543
0 - 99---------------	275,610	274,181	280,968	276,951	270,842
100 - 249---------------	199,446	196,900	203,787	202,601	194,934
250 - 499---------------	210,355	206,469	214,008	210,021	206,406
500 and over------------	888,132	893,574	952,398	947,828	926,361
Engines and turbines--------------	93,571	97,682	100,473	99,936	95,744
0 - 99---------------	(1/)	(1/)	(1/)	(1/)	(1/)
100 - 249---------------	4,683	4,958	5,133	4,894	4,459
250 - 499---------------	9,578	8,752	9,010	8,356	7,479
500 and over------------	78,172	82,882	85,345	85,654	82,869

See footnotes at end of table.

Table 1 - Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly October 1952 - October 1951 - Continued

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Agricultural machinery and tractors------------------------	149,079	166,811	188,318	188,774	185,585
0 - 99---------------	13,586	11,547	11,611	12,795	12,941
100 - 249---------------	15,892	15,571	17,593	17,185	16,883
250 - 499---------------	16,336	16,181	18,888	18,877	18,007
500 and over------------	103,265	123,512	140,226	139,917	137,754
Construction and mining machinery-	128,813	129,298	133,741	130,801	126,147
0 - 99---------------	15,833	15,827	16,135	15,162	15,711
100 - 249---------------	23,762	23,427	24,747	24,074	21,860
250 - 499---------------	21,841	21,831	23,461	23,000	22,724
500 and over------------	67,377	68,213	69,398	68,565	65,852
Metalworking machinery------------	309,569	302,951	314,535	306,272	285,410
0 - 99---------------	80,661	79,295	84,484	79,397	74,177
100 - 249---------------	43,322	42,673	44,084	43,409	41,457
250 - 499---------------	40,999	41,188	41,338	41,230	40,182
500 and over------------	144,587	139,795	144,629	142,236	129,594
Special-industry machinery (except metalworking machinery)----------	180,905	184,613	189,206	189,499	193,738
0 - 99---------------	54,908	56,868	57,926	57,100	57,666
100 - 249---------------	31,352	31,422	31,418	32,185	31,798
250 - 499---------------	26,203	25,722	26,975	26,139	25,804
500 and over------------	68,442	70,601	72,887	74,075	78,470
General industrial machinery------	230,640	231,826	238,328	239,075	237,433
0 - 99---------------	35,371	35,455	34,529	35,867	35,961
100 - 249---------------	40,572	40,690	42,211	42,768	41,772
250 - 499---------------	43,745	43,374	44,462	43,913	43,486
500 and over------------	110,952	112,307	117,126	116,527	116,214
Office and store machines and devices--------------------------	107,529	104,007	109,625	108,105	108,225
0 - 99---------------	5,796	5,655	5,764	4,344	4,860
100 - 249---------------	8,036	6,889	7,690	7,313	7,145
250 - 499---------------	7,714	7,500	7,690	7,555	7,663
500 and over------------	85,983	83,963	88,481	88,893	88,557

See footnotes at end of table.

Table 1 - Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Service-industry and household machines	176,661	165,126	175,858	167,710	160,971
0 - 99	13,595	14,880	14,030	12,520	11,522
100 - 249	13,611	13,271	12,573	12,369	11,484
250 - 499	19,114	18,216	18,212	16,894	17,379
500 and over	130,341	118,759	131,043	125,927	120,586
Miscellaneous machinery parts	196,776	188,810	201,077	207,229	205,290
0 - 99	54,722	53,564	55,504	58,734	57,067
100 - 249	18,216	17,999	18,338	18,404	18,076
250 - 499	24,825	23,705	23,972	24,057	23,682
500 and over	99,013	93,542	103,263	106,034	106,465
Electrical machinery	1,002,179	908,977	932,563	940,384	913,242
0 - 99	117,878	99,862	96,779	97,976	91,592
100 - 249	92,904	82,836	85,552	84,697	82,834
250 - 499	141,826	127,444	131,113	131,326	128,945
500 and over	649,571	598,835	619,119	626,385	609,871
Electrical generating, transmission, distribution, and industrial apparatus	374,743	350,108	361,174	367,271	357,505
0 - 99	63,777	56,767	54,434	55,883	54,545
100 - 249	32,507	31,061	32,046	31,511	31,354
250 - 499	42,908	40,908	41,001	40,642	39,679
500 and over	235,551	221,372	233,693	239,235	231,927
Electrical appliances	49,244	40,534	43,239	44,730	44,695
0 - 99	5,758	4,259	4,381	4,565	3,501
100 - 249	4,913	4,116	4,130	4,178	4,633
250 - 499	9,996	7,634	8,972	9,480	9,286
500 and over	28,577	24,525	25,756	26,507	27,275
Insulated wire and cable	25,085	22,572	24,178	24,194	23,402
0 - 99	3,003	2,650	2,771	2,860	2,723
100 - 249	4,019	3,418	3,892	3,863	3,657
250 - 499	8,966	7,887	8,413	8,368	8,208
500 and over	9,097	8,617	9,102	9,103	8,814

See footnotes at end of table.

Table 1 - Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly October 1952 - October 1951 - Continued

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Electrical equipment for vehicles-	81,143	76,359	81,159	82,063	82,179
0 - 99---------------	906	(1/)	(1/)	(1/)	(1/)
100 - 249---------------	4,602	4,460	4,978	4,888	5,136
250 - 499---------------	5,089	4,895	4,741	5,087	4,972
500 and over------------	70,546	66,152	70,464	71,052	71,004
Electric lamps--------------------	17,812	18,652	20,758	23,181	24,943
0 - 99---------------	(1/)	(1/)	(1/)	(1/)	(1/)
100 - 249---------------	(2/)	(2/)	(2/)	(2/)	(2/)
250 - 499---------------	6,532	6,768	7,378	7,926	8,524
500 and over------------	10,854	11,505	12,963	14,821	15,931
Communication equipment-----------	403,601	352,195	354,030	351,344	332,504
0 - 99---------------	37,830	29,088	27,951	27,386	23,537
100 - 249---------------	38,918	32,385	34,121	33,753	31,372
250 - 499---------------	57,928	49,707	50,993	50,843	48,847
500 and over------------	268,925	241,015	240,965	239,362	228,748
Miscellaneous electrical products-	50,551	48,557	48,025	47,601	48,014
0 - 99---------------	6,178	5,867	5,849	5,812	5,731
100 - 249---------------	7,945	7,396	6,385	6,504	6,682
250 - 499---------------	10,407	9,645	9,615	8,980	9,429
500 and over------------	26,021	25,649	26,176	26,305	26,172
Transportation equipment-----------	1,719,242	1,500,502	1,612,784	1,550,368	1,503,704
0 - 99---------------	62,209	59,783	56,184	56,267	54,135
100 - 249---------------	76,732	75,160	73,054	71,988	67,475
250 - 499---------------	75,480	70,608	71,856	70,919	69,183
500 and over------------	1,504,821	1,294,951	1,411,690	1,351,194	1,312,911
Automobiles-----------------------	854,559	668,813	806,305	774,631	805,196
0 - 99---------------	23,246	24,135	23,184	24,390	23,072
100 - 249---------------	36,647	34,964	35,217	35,778	34,967
250 - 499---------------	40,227	37,126	39,664	40,046	41,188
500 and over------------	754,439	572,588	708,240	674,417	705,969
Aircraft and parts----------------	629,556	606,093	578,694	556,840	488,892
0 - 99---------------	18,818	16,254	15,515	14,822	13,991
100 - 249---------------	20,705	20,597	18,656	18,328	16,416
250 - 499---------------	20,541	18,441	16,075	14,599	12,224
500 and over------------	569,492	550,801	528,448	509,091	446,261

See footnotes at end of table.

Table 1 - Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued

Industry and size class cf establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Ship and boat building and repairing	152,046	150,956	145,322	131,644	122,246
0 - 99	16,785	16,243	14,147	13,659	13,564
100 - 249	14,047	14,194	13,941	12,752	10,955
250 - 499	8,842	9,952	9,975	10,022	8,998
500 and over	112,372	110,567	107,259	95,211	88,729
Railroad equipment	69,975	62,890	71,537	76,336	76,025
0 - 99	1,290	1,171	1,352	1,272	1,422
100 - 249	1,809	2,265	2,163	2,133	2,133
250 - 499	5,870	5,089	6,142	6,252	6,773
500 and over	61,006	54,365	61,880	66,679	65,697
Other transportation equipment	13,106	11,750	10,926	10,917	11,345
0 - 99	2,070	1,980	1,986	2,124	2,086
100 - 249	3,524	3,140	3,077	2,997	3,004
250 - 499	(3/)	(3/)	(3/)	(3/)	(3/)
500 and over	7,512	6,630	5,863	5,796	6,255

1/ Because of the small size and high variance, the estimate for this stratum is not considered sufficiently reliable for publication. Although the industry total includes employment for establishments in this size group, data obtained by subtracting the sum of employment in the other size classes from the industry total will not necessarily yield an accurate estimate for the 0 - 99 size class.

2/ Data for this size class have been combined with those in size class 250 - 499 to avoid disclosure of establishment information.

3/ Data for this size class have been combined with those in size class 100 - 249.

Table 2 - Production-Worker Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951

Industry and size class of establishment	Production workers				
	October 1952	July 1952	April 1952	January 1952	October 1951
Total, selected metalworking industries (34-37)	4,195,721	3,783,685	4,092,019	4,039,056	3,977,921
0 - 99	606,180	566,835	576,871	569,496	569,765
100 - 249	442,985	415,431	432,686	433,749	424,309
250 - 499	475,631	437,085	460,259	458,433	452,705
500 and over	2,670,925	2,364,334	2,622,203	2,577,378	2,531,142
Fabricated metal products (except ordnance, machinery, and transportation equipment)	844,806	732,819	807,134	804,396	827,608
0 - 99	226,973	207,518	214,020	211,648	224,505
100 - 249	153,606	139,606	147,865	149,508	151,028
250 - 499	139,151	123,213	132,456	132,388	133,138
500 and over	325,076	262,482	312,793	310,852	318,937
Tin cans and other tinware	43,715	42,697	40,652	38,876	43,098
0 - 99	(1/)	(1/)	(1/)	(1/)	(1/)
100 - 249	8,269	8,561	7,575	7,305	8,420
250 - 499	12,907	12,678	11,461	11,193	13,174
500 and over	21,667	20,567	20,741	19,545	20,618
Cutlery, hand tools, and hardware	121,231	106,275	121,807	124,948	126,514
0 - 99	20,908	18,770	21,039	22,510	22,327
100 - 249	20,677	19,527	21,637	22,126	21,686
250 - 499	21,180	19,719	21,556	21,878	21,778
500 and over	58,466	48,259	57,575	58,434	60,723
Heating apparatus (except electric) and plumbers' supplies	130,253	111,475	115,749	115,351	120,903
0 - 99	13,160	11,806	12,664	13,370	13,347
100 - 249	26,570	23,416	22,256	22,361	24,241
250 - 499	25,426	21,696	21,893	21,681	21,015
500 and over	65,097	54,557	58,936	57,939	62,300
Fabricated structural metal products	191,908	162,849	186,289	186,724	189,915
0 - 99	65,423	62,460	61,027	61,727	67,754
100 - 249	40,411	37,466	40,421	40,080	39,558
250 - 499	28,589	25,287	28,109	28,134	27,485
500 and over	57,485	37,636	56,732	56,783	55,118

See footnotes at end of table.

Table 2 - Production-Worker Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued

Industry and size class of establishment	Production workers				
	October 1952	July 1952	April 1952	January 1952	October 1951
Metal stamping, coating, and engraving-------------------------	157,840	134,738	145,999	142,988	149,448
0 - 99---------------	60,877	54,210	56,334	54,537	59,938
100 - 249---------------	20,724	18,324	20,013	20,142	20,021
250 - 499---------------	16,112	13,738	15,324	15,130	15,406
500 and over------------	60,127	48,466	54,328	53,179	54,083
Lighting fixtures-----------------	39,655	35,329	36,499	37,566	40,314
0 - 99---------------	15,785	13,282	13,234	13,484	15,250
100 - 249---------------	6,446	5,696	5,802	6,160	6,368
250 - 499---------------	3,789	3,517	3,894	3,896	4,241
500 and over------------	13,635	12,834	13,569	14,026	14,455
Fabricated wire products----------	54,606	45,793	55,094	52,448	54,342
0 - 99---------------	18,870	18,067	18,737	16,562	17,226
100 - 249---------------	9,454	7,835	9,305	9,364	9,410
250 - 499---------------	9,333	7,214	8,924	9,570	9,710
500 and over------------	16,949	12,677	18,128	16,952	17,996
Miscellaneous fabricated metal products--------------------------	105,598	93,663	105,045	105,495	103,074
0 - 99---------------	31,078	28,032	30,110	28,625	27,777
100 - 249---------------	21,055	18,781	20,856	21,970	21,324
250 - 499---------------	21,815	19,364	21,295	20,906	20,329
500 and over------------	31,650	27,486	32,784	33,994	33,644
Machinery (except electrical)------	1,208,586	1,204,797	1,288,192	1,275,680	1,241,175
0 - 99---------------	226,350	225,219	233,846	227,892	223,934
100 - 249---------------	151,351	148,410	155,674	155,304	149,398
250 - 499---------------	158,656	155,127	162,520	159,631	156,420
500 and over------------	672,229	676,041	736,152	732,853	711,423
Engines and turbines--------------	69,017	72,081	74,620	74,338	70,861
0 - 99---------------	933	897	(1/)	(1/)	(1/)
100 - 249---------------	3,498	3,689	3,942	3,778	3,335
250 - 499---------------	6,973	6,328	6,568	6,167	5,452
500 and over------------	57,613	61,167	63,326	63,555	61,323

See footnotes at end of table.

Table 2 - Production-Worker Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued

Industry and size class of establishment	Production workers October 1952	July 1952	April 1952	January 1952	October 1951
Agricultural machinery and tractors	109,248	125,848	148,876	148,652	145,599
0 - 99	11,775	9,698	9,792	10,974	11,008
100 - 249	12,475	12,161	14,250	13,954	13,506
250 - 499	11,680	11,602	14,336	14,309	13,361
500 and over	73,318	92,387	110,498	109,415	107,724
Construction and mining machinery	96,364	96,906	101,899	99,618	95,597
0 - 99	11,984	12,443	13,011	11,956	12,623
100 - 249	18,368	18,109	19,451	18,850	17,073
250 - 499	16,490	16,286	17,666	17,457	16,907
500 and over	49,522	50,068	51,771	51,355	48,994
Metalworking machinery	248,551	242,409	254,605	246,456	227,714
0 - 99	68,957	67,753	72,567	67,393	63,346
100 - 249	34,181	33,669	34,959	34,510	32,958
250 - 499	32,635	32,786	32,822	32,613	31,623
500 and over	112,778	108,201	114,257	111,940	99,787
Special-industry machinery (except metalworking machinery)	137,980	141,354	146,763	146,752	149,739
0 - 99	44,308	46,247	47,395	46,412	47,121
100 - 249	24,047	23,975	24,129	25,040	24,707
250 - 499	19,731	19,240	20,501	19,892	19,843
500 and over	49,894	51,892	54,738	55,408	58,068
General industrial machinery	164,048	163,818	170,953	173,361	172,161
0 - 99	27,278	27,226	26,645	27,831	28,102
100 - 249	27,954	27,710	29,168	29,809	29,366
250 - 499	30,928	30,492	31,746	31,705	31,484
500 and over	77,888	78,390	83,394	84,016	83,209
Office and store machines and devices	89,029	85,899	90,858	89,799	90,872
0 - 99	4,915	4,859	4,977	3,544	4,096
100 - 249	6,469	5,360	6,198	5,894	5,773
250 - 499	6,279	6,075	6,244	6,135	6,261
500 and over	71,366	69,605	73,439	74,226	74,742

See footnotes at end of table.

Table 2 - Production-Worker Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued

Industry and size class of establishment	Production workers				
	October 1952	July 1952	April 1952	January 1952	October 1951
Service-industry and household machines------------------------	137,129	126,392	136,998	130,079	123,470
0 - 99---------------	10,477	11,797	11,183	9,696	8,713
100 - 249---------------	9,950	9,608	9,090	8,893	8,165
250 - 499---------------	14,775	13,899	13,987	12,637	13,017
500 and over------------	101,927	91,088	102,738	98,853	93,575
Miscellaneous machinery parts-----	157,220	150,090	162,620	166,625	165,162
0 - 99---------------	45,723	44,299	47,492	49,248	48,174
100 - 249---------------	14,409	14,129	14,487	14,576	14,515
250 - 499---------------	19,165	18,419	18,650	18,716	18,472
500 and over------------	77,923	73,243	81,991	84,085	84,001
Electrical machinery---------------	772,250	684,373	713,212	724,544	702,594
0 - 99---------------	100,048	83,341	80,943	81,666	75,695
100 - 249---------------	74,958	65,831	68,996	69,019	67,493
250 - 499---------------	115,439	101,128	105,655	107,333	105,349
500 and over------------	481,805	434,073	457,618	466,526	454,057
Electrical generating, transmission, distribution, and industrial apparatus-------------	277,762	254,046	267,882	272,764	264,361
0 - 99---------------	54,770	48,402	46,491	48,367	47,099
100 - 249---------------	25,518	23,855	25,284	25,083	24,864
250 - 499---------------	32,353	30,149	31,120	31,132	30,513
500 and over------------	165,121	151,640	164,987	168,182	161,885
Electrical appliances-------------	40,705	32,394	35,178	37,049	36,790
0 - 99---------------	4,934	3,494	3,643	3,845	2,879
100 - 249---------------	4,161	3,359	3,411	3,480	3,966
250 - 499---------------	8,377	5,970	7,339	7,935	7,661
500 and over------------	23,233	19,571	20,785	21,789	22,284
Insulated wire and cable----------	20,859	18,193	19,805	19,971	18,599
0 - 99---------------	2,511	2,124	2,209	2,387	1,773
100 - 249---------------	3,356	2,799	3,211	3,210	3,006
250 - 499---------------	7,460	6,333	6,949	6,937	6,698
500 and over------------	7,532	6,937	7,436	7,437	7,122

See footnotes at end of table.

Table 2 - Production-Worker Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued

Industry and size class of establishment	Production workers				
	October 1952	July 1952	April 1952	January 1952	October 1951
Electrical equipment for vehicles-	64,431	60,553	65,230	66,582	67,365
0 - 99---------------	(1/)	(1/)	(1/)	(1/)	(1/)
100 - 249---------------	3,631	3,497	4,032	3,989	4,155
250 - 499---------------	3,852	3,789	3,608	4,054	4,042
500 and over------------	56,225	52,591	56,794	57,694	58,294
Electric lamps-------------------	15,151	15,842	17,868	20,300	22,294
0 - 99---------------	(1/)	(1/)	(1/)	(1/)	(1/)
100 - 249---------------	(2/)	(2/)	(2/)	(2/)	(2/)
250 - 499---------------	5,685	5,872	6,478	7,165	7,748
500 and over------------	9,074	9,618	11,006	12,731	14,099
Communication equipment----------	313,889	265,917	270,248	271,078	255,812
0 - 99---------------	31,832	23,697	22,852	21,194	17,909
100 - 249---------------	31,952	26,426	28,116	28,184	26,290
250 - 499---------------	48,949	41,058	42,171	42,657	40,738
500 and over------------	201,156	174,736	177,109	179,043	170,875
Miscellaneous electrical products-	39,453	37,428	37,001	36,800	37,373
0 - 99---------------	4,886	4,596	4,568	4,624	4,714
100 - 249---------------	6,340	5,895	4,942	5,073	5,212
250 - 499---------------	8,763	7,957	7,990	7,453	7,949
500 and over------------	19,464	18,980	19,501	19,650	19,498
Transportation equipment----------	1,370,079	1,161,696	1,283,481	1,234,436	1,206,544
0 - 99---------------	52,809	50,757	48,062	48,290	45,631
100 - 249---------------	63,070	61,584	60,151	59,918	56,390
250 - 499---------------	62,385	57,617	59,628	59,081	57,798
500 and over------------	1,191,815	991,738	1,115,640	1,067,147	1,046,725
Automobiles-----------------------	705,109	521,760	661,251	633,200	666,516
0 - 99---------------	19,641	20,314	19,466	20,525	19,553
100 - 249---------------	29,757	28,268	28,702	29,553	29,023
250 - 499---------------	32,544	29,404	32,326	32,798	34,104
500 and over------------	623,167	443,756	580,757	550,324	583,836
Aircraft and parts----------------	464,290	448,663	428,403	415,386	362,781
0 - 99---------------	15,443	13,415	13,198	12,790	11,837
100 - 249---------------	16,233	16,004	14,384	14,699	13,297
250 - 499---------------	16,885	14,956	12,940	11,679	9,645
500 and over------------	415,729	404,288	387,881	376,218	328,002

See footnotes at end of table.

Table 2 - Production-Worker Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly October 1952 - October 1951 - Continued

Industry and size class of establishment	Production workers				
	October 1952	July 1952	April 1952	January 1952	October 1951
Ship and boat building and repairing	133,512	132,897	127,943	114,901	105,573
0 - 99	14,918	14,421	12,607	12,126	11,310
100 - 249	12,628	12,775	12,686	11,413	9,794
250 - 499	8,090	9,176	9,227	9,290	8,251
500 and over	97,876	96,525	93,423	82,072	76,218
Railroad equipment	55,784	48,312	56,595	61,698	61,998
0 - 99	1,021	909	1,078	1,006	1,139
100 - 249	1,458	1,896	1,806	1,768	1,781
250 - 499	4,866	4,081	5,135	5,314	5,798
500 and over	48,439	41,426	48,576	53,610	53,280
Other transportation equipment	11,384	10,064	9,289	9,251	9,676
0 - 99	1,786	1,698	1,713	1,843	1,792
100 - 249	2,994	2,623	2,573	2,485	2,495
250 - 499	(3/)	(3/)	(3/)	(3/)	(3/)
500 and over	6,604	5,743	5,003	4,923	5,389

1/ Because of the small size and high variance, the estimate for this stratum is not considered sufficiently reliable for publication. Although the industry total includes employment for establishments in this size group, data obtained by subtracting the sum of employment in the other size classes from the industry total will not necessarily yield an accurate estimate for the 0 - 99 size class.

2/ Data for this size class have been combined with those in size class 250 - 499 to avoid disclosure of establishment information.

3/ Data for this size class have been combined with those in size class 100 - 249.

Table 3 - Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly

October 1952 - October 1951

(Cumulative by Size Class)

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Total, selected metalworking industries (34-37)	5,326,922	4,895,802	5,184,581	5,111,197	5,020,723
0 - 99	727,195	685,296	690,601	685,797	683,154
0 - 249	1,285,753	1,214,317	1,235,514	1,228,775	1,213,216
0 - 499	1,882,119	1,770,940	1,813,575	1,801,845	1,779,868
Fabricated metal products (except ordnance, machinery, and transportation equipment)	1,031,958	915,199	988,073	983,044	1,005,234
0 - 99	271,498	251,470	256,670	254,603	266,585
0 - 249	460,974	425,595	439,190	438,295	451,404
0 - 499	629,759	577,697	600,274	599,099	613,522
Tin cans and other tinware	49,131	48,529	46,315	44,576	49,067
0 - 99	(1/)	(1/)	(1/)	(1/)	(1/)
0 - 249	10,441	10,794	9,819	9,456	10,749
0 - 499	24,976	25,184	22,932	22,441	25,822
Cutlery, hand tools, and hardware	147,544	132,138	147,319	150,147	151,369
0 - 99	25,523	23,807	25,224	26,466	26,180
0 - 249	50,556	47,390	51,013	52,466	51,663
0 - 499	75,982	71,205	76,675	78,449	77,497
Heating apparatus (except electric) and plumbers' supplies	161,584	141,941	145,[illegible]87	144,730	150,316
0 - 99	16,521	15,250	16,020	16,651	16,586
0 - 249	49,692	44,891	44,336	45,028	46,887
0 - 499	81,514	72,706	72,225	72,577	73,968
Fabricated structural metal products	249,257	217,538	240,286	240,746	243,356
0 - 99	83,356	79,349	77,544	78,897	85,222
0 - 249	136,739	129,237	130,590	131,289	136,864
0 - 499	172,610	161,532	165,639	166,325	171,306
Metal stamping, coating, and engraving	184,656	160,786	171,381	168,097	174,301
0 - 99	67,464	61,083	63,156	61,737	66,335
0 - 249	91,903	83,160	86,756	85,602	89,834
0 - 499	110,881	99,437	104,721	103,402	108,023

See footnotes at end of table.

Table 3 - Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued
(Cumulative by Size Class)

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Lighting fixtures	48,829	44,370	45,566	46,124	49,203
0 - 99	19,366	16,839	16,833	16,709	18,717
0 - 249	27,179	23,871	23,917	24,221	26,380
0 - 499	31,828	28,267	28,689	29,019	31,661
Fabricated wire products	64,886	55,328	65,229	62,874	64,412
0 - 99	22,196	21,121	21,912	19,933	20,258
0 - 249	33,358	30,515	32,950	31,107	31,460
0 - 499	44,923	39,811	43,927	42,693	43,215
Miscellaneous fabricated metal products	126,071	114,569	125,990	125,750	123,210
0 - 99	36,070	33,000	34,980	33,248	32,272
0 - 249	61,106	55,737	59,809	59,126	57,567
0 - 499	87,045	79,555	85,466	84,193	82,030
Machinery (except electrical)	1,573,543	1,571,124	1,651,161	1,637,401	1,598,543
0 - 99	275,610	274,181	280,968	276,951	270,842
0 - 249	475,056	471,081	484,755	479,552	465,776
0 - 499	685,411	677,550	698,763	689,573	672,182
Engines and turbines	93,571	97,682	100,473	99,936	95,744
0 - 99	(1/)	(1/)	(1/)	(1/)	(1/)
0 - 249	5,821	6,048	6,118	5,926	5,396
0 - 499	15,399	14,800	15,128	14,282	12,875
Agricultural machinery and tractors	149,079	166,811	188,318	188,774	185,585
0 - 99	13,586	11,547	11,611	12,795	12,941
0 - 249	29,478	27,118	29,204	29,980	29,824
0 - 499	45,814	43,299	48,092	48,857	47,831
Construction and mining machinery	128,813	129,298	133,741	130,801	126,147
0 - 99	15,833	15,827	16,135	15,162	15,711
0 - 249	39,595	39,254	40,882	39,236	37,571
0 - 499	61,436	61,085	64,343	62,236	60,295
Metalworking machinery	309,569	302,951	314,535	306,272	285,410
0 - 99	80,661	79,295	84,484	79,397	74,177
0 - 249	123,983	121,968	128,568	122,806	115,634
0 - 499	164,982	163,156	169,906	164,036	155,816

See footnotes at end of table.

Table 3 - Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued
(Cumulative by Size Class)

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Special-industry machinery (except metalworking machinery)----------	180,905	184,613	189,206	189,499	193,738
0 - 99--------------	54,908	56,868	57,926	57,100	57,666
0 - 249--------------	86,260	88,290	89,344	89,285	89,464
0 - 499--------------	112,463	114,012	116,319	115,424	115,268
General industrial machinery------	230,640	231,826	238,328	239,075	237,433
0 - 99--------------	35,371	35,455	34,529	35,867	35,961
0 - 249--------------	75,943	76,145	76,740	78,635	77,733
0 - 499--------------	119,688	119,519	121,202	122,548	121,219
Office and store machines and devices--------------------------	107,529	104,007	109,625	108,105	108,225
0 - 99--------------	5,796	5,655	5,764	4,344	4,860
0 - 249--------------	13,832	12,544	13,454	11,657	12,005
0 - 499--------------	21,546	20,044	21,144	19,212	19,668
Service-industry and household machines--------------------------	176,661	165,126	175,858	167,710	160,971
0 - 99--------------	13,595	14,880	14,030	12,520	11,522
0 - 249--------------	27,206	28,151	26,603	24,889	23,006
0 - 499--------------	46,320	46,367	44,815	41,783	40,385
Miscellaneous machinery parts-----	196,776	188,810	201,077	207,229	205,290
0 - 99--------------	54,722	53,564	55,504	58,734	57,067
0 - 249--------------	72,938	71,563	73,842	77,138	75,143
0 - 499--------------	97,763	95,268	97,814	101,195	98,825
Electrical machinery---------------	1,002,179	908,977	932,563	940,384	913,242
0 - 99--------------	117,878	99,862	96,779	97,976	91,592
0 - 249--------------	210,782	182,698	182,331	182,673	174,426
0 - 499--------------	352,608	310,142	313,444	313,999	303,371
Electrical generating, transmission, distribution, and industrial apparatus-------------	374,743	350,108	361,174	367,271	357,505
0 - 99--------------	63,777	56,767	54,434	55,883	54,545
0 - 249--------------	96,284	87,828	86,480	87,394	85,899
0 - 499--------------	139,192	128,736	127,481	128,036	125,578

See footnotes at end of table.

Table 3 - Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued
(Cumulative by Size Class)

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Electrical appliances	49,244	40,534	43,239	44,730	44,695
0 - 99	5,758	4,259	4,381	4,565	3,501
0 - 249	10,671	8,375	8,511	8,743	8,134
0 - 499	20,667	16,009	17,483	18,223	17,420
Insulated wire and cable	25,085	22,572	24,178	24,194	23,402
0 - 99	3,003	2,650	2,771	2,860	2,723
0 - 249	7,022	6,068	6,663	6,723	6,380
0 - 499	15,988	13,955	15,076	15,091	14,588
Electrical equipment for vehicles	81,143	76,359	81,159	82,063	82,179
0 - 99	(1/)	(1/)	(1/)	(1/)	(1/)
0 - 249	4,602	4,460	5,954	5,924	6,203
0 - 499	9,691	9,355	10,695	11,011	11,175
Electric lamps	17,812	18,652	20,758	23,181	24,943
0 - 99	(1/)	(1/)	(1/)	(1/)	(1/)
0 - 249	(2/)	(2/)	(2/)	(2/)	(2/)
0 - 499	6,532	6,768	7,795	8,360	9,012
Communication equipment	403,601	352,195	354,030	351,344	332,504
0 - 99	37,830	29,088	27,951	27,386	23,537
0 - 249	76,748	61,473	62,072	61,139	54,909
0 - 499	134,676	111,180	113,065	111,982	103,756
Miscellaneous electrical products	50,551	48,557	48,025	47,601	48,014
0 - 99	6,178	5,867	5,849	5,812	5,731
0 - 249	14,123	13,263	12,234	12,316	12,413
0 - 499	24,530	22,908	21,849	21,296	21,842
Transportation equipment	1,719,242	1,500,502	1,612,784	1,550,368	1,503,704
0 - 99	62,209	59,783	56,184	56,267	54,135
0 - 249	138,941	134,943	129,238	128,255	121,610
0 - 499	214,421	205,551	201,094	199,174	190,793
Automobiles	854,559	668,813	806,305	774,631	805,196
0 - 99	23,246	24,135	23,184	24,390	23,072
0 - 249	59,893	59,099	58,401	60,168	58,039
0 - 499	100,120	96,225	98,065	100,214	99,227

See footnotes at end of table.

Table 3 - Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued
(Cumulative by Size Class)

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Aircraft and parts----------------	629,556	606,093	578,694	556,840	488,892
0 - 99--------------	18,818	16,254	15,515	14,822	13,991
0 - 249--------------	39,523	36,851	34,171	33,150	30,407
0 - 499--------------	60,064	55,292	50,246	47,749	42,631
Ship and boat building and repairing------------------------	152,046	150,956	145,322	131,644	122,246
0 - 99--------------	16,785	16,243	14,147	13,659	13,564
0 - 249--------------	30,832	30,437	28,088	26,411	24,519
0 - 499--------------	39,674	40,389	38,063	36,433	33,517
Railroad equipment----------------	69,975	62,890	71,537	76,336	76,025
0 - 99--------------	1,290	1,171	1,352	1,272	1,422
0 - 249--------------	3,099	3,436	3,515	3,405	3,555
0 - 499--------------	8,969	8,525	9,657	9,657	10,328
Other transportation equipment----	13,106	11,750	10,926	10,917	11,345
0 - 99--------------	2,070	1,980	1,986	2,124	2,086
0 - 249--------------	5,594	5,120	5,063	5,121	5,090
0 - 499--------------	5,504	5,120	5,063	5,121	5,090

1/ Because of the small size and high variance, the estimate for this stratum is not considered sufficiently reliable for publication. Although the industry total includes employment for establishments in this size group, data obtained by subtracting the sum of employment in the other size classes from the industry total will not necessarily yield an accurate estimate for the 0 - 99 size class.

2/ Data for this size class have been combined with those in size class 250 - 499 to avoid disclosure of establishment information.

Table 4 - Index of Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly

October 1952 - October 1951

(July 1951 = 100.0)

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Total, selected metalworking industries (34-37)	107.5	98.8	104.7	103.2	101.4
0 - 99	109.2	102.9	103.7	102.9	102.5
100 - 249	108.3	102.6	105.6	105.3	102.8
250 - 499	108.2	101.0	104.9	104.0	102.8
500 and over	107.0	97.0	104.7	102.8	100.6
Fabricated metal products (except ordnance, machinery, and transportation equipment)	101.7	90.2	97.3	96.8	99.0
0 - 99	100.8	93.4	95.3	94.5	99.0
100 - 249	103.1	94.8	99.3	100.0	100.6
250 - 499	103.0	92.8	98.3	98.2	99.0
500 and over	101.0	84.8	97.4	96.4	98.4
Tin cans and other tinware	99.0	97.8	93.3	89.8	98.9
0 - 99	(1/)	(1/)	(1/)	(1/)	(1/)
100 - 249	94.2	97.5	88.0	84.7	97.1
250 - 499	93.8	92.8	84.6	83.8	97.3
500 and over	104.7	101.2	101.3	95.9	100.7
Cutlery, hand tools, and hardware	93.4	83.7	93.3	95.1	95.8
0 - 99	86.1	80.3	85.1	89.3	88.3
100 - 249	97.2	91.6	100.2	101.0	99.0
250 - 499	103.0	96.5	104.0	105.3	104.7
500 and over	91.9	78.2	90.7	92.1	94.9
Heating apparatus (except electric) and plumbers' supplies	104.0	91.3	93.9	93.1	96.7
0 - 99	90.4	83.4	87.7	91.1	90.7
100 - 249	108.8	97.2	92.9	93.1	99.4
250 - 499	111.6	97.6	97.8	96.6	95.0
500 and over	102.4	88.6	94.4	92.3	97.7
Fabricated structural metal products	105.0	91.6	101.2	101.4	102.5
0 - 99	100.9	96.0	93.8	95.5	103.1
100 - 249	107.1	100.1	106.4	105.1	103.6
250 - 499	105.9	95.4	103.5	103.5	101.7
500 and over	107.9	78.8	105.0	104.7	101.4

See footnotes at end of table.

Table 4 - Index of Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued
(July 1951 = 100.0)

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Metal stamping, coating, and engraving----------------------	103.3	89.9	95.9	94.0	97.5
0 - 99---------------	101.6	92.0	95.1	92.9	99.9
100 - 249---------------	99.7	90.1	96.3	97.4	95.9
250 - 499---------------	99.0	84.9	93.7	92.8	94.9
500 and over------------	107.5	89.4	97.1	94.2	96.5
Lighting fixtures-----------------	103.3	93.9	96.4	97.6	104.1
0 - 99---------------	115.1	100.1	100.1	99.3	111.3
100 - 249---------------	107.3	96.6	97.3	103.2	105.3
250 - 499---------------	83.3	78.8	85.5	86.0	94.6
500 and over------------	96.8	91.7	96.1	97.4	99.9
Fabricated wire products----------	98.2	83.7	98.7	95.1	97.4
0 - 99---------------	103.3	98.3	102.0	92.8	94.3
100 - 249---------------	98.6	83.0	97.5	98.7	99.0
250 - 499---------------	98.6	79.2	93.6	98.8	100.2
500 and over------------	92.5	71.9	98.7	93.5	98.2
Miscellaneous fabricated metal products-------------------------	102.9	93.5	102.8	102.6	100.5
0 - 99---------------	109.2	99.9	105.9	100.7	97.7
100 - 249---------------	102.0	92.7	101.2	105.5	103.1
250 - 499---------------	104.7	96.1	103.5	101.1	98.7
500 and over------------	97.1	87.1	100.8	103.4	102.5
Machinery (except electrical)------	99.3	99.1	104.2	103.3	100.8
0 - 99---------------	106.9	106.3	109.0	107.4	105.0
100 - 249---------------	104.9	103.6	107.2	106.6	102.6
250 - 499---------------	104.0	102.1	105.8	103.8	102.0
500 and over------------	95.0	95.6	101.9	101.4	99.1
Engines and turbines--------------	100.7	105.1	108.1	107.6	103.1
0 - 99---------------	(1/)	(1/)	(1/)	(1/)	(1/)
100 - 249---------------	109.5	116.0	120.1	114.5	104.3
250 - 499---------------	140.3	128.2	132.0	122.4	109.6
500 and over------------	96.6	102.4	105.4	105.8	102.4

See footnotes at end of table.

Table 4 - Index of Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued
(July 1951 = 100.0)

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Agricultural machinery and tractors	78.6	87.9	99.3	99.5	97.8
0 - 99	111.4	94.7	95.2	104.9	106.1
100 - 249	96.2	94.3	106.5	104.1	102.2
250 - 499	91.0	90.2	105.2	105.2	100.3
500 and over	72.2	86.4	98.1	97.8	96.3
Construction and mining machinery	103.9	104.3	107.9	105.6	101.8
0 - 99	95.5	95.4	97.3	91.4	94.7
100 - 249	116.0	114.4	120.8	117.5	106.7
250 - 499	97.1	97.0	104.3	102.2	101.0
500 and over	104.7	106.0	107.8	106.5	102.3
Metalworking machinery	108.1	105.8	109.8	106.9	99.7
0 - 99	116.0	114.0	121.4	114.1	106.6
100 - 249	108.0	106.4	109.9	108.2	103.3
250 - 499	105.6	106.1	106.5	106.2	103.5
500 and over	104.9	101.4	104.9	103.2	94.0
Special-industry machinery (except metalworking machinery)	94.4	96.4	98.8	98.9	101.1
0 - 99	99.0	102.5	104.4	102.9	103.9
100 - 249	99.3	99.5	99.5	101.9	100.7
250 - 499	101.6	99.7	104.6	101.3	100.0
500 and over	87.0	89.7	92.6	94.1	99.7
General industrial machinery	99.1	99.6	102.4	102.7	102.0
0 - 99	98.2	98.4	95.8	99.6	99.8
100 - 249	102.6	102.9	106.7	108.2	105.6
250 - 499	102.6	101.7	104.3	103.0	102.0
500 and over	96.9	98.1	102.3	101.7	101.5
Office and store machines and devices	104.0	100.6	106.1	104.6	104.7
0 - 99	115.3	112.5	114.7	86.4	96.7
100 - 249	113.8	97.6	108.9	103.6	101.2
250 - 499	111.0	107.9	110.6	108.7	110.3
500 and over	102.0	99.6	104.9	105.4	105.0

See footnotes at end of table.

Table 4 - Index of Total Employment in Selected Metalworking Industries, by
Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued
(July 1951 = 100.0)

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Service-industry and household machines	104.6	97.7	104.1	99.3	95.3
0 - 99	119.2	130.5	123.1	109.8	101.1
100 - 249	109.5	106.8	101.2	99.5	92.4
250 - 499	107.8	102.7	102.7	95.3	98.0
500 and over	102.3	93.2	102.9	98.8	94.6
Miscellaneous machinery parts	100.6	96.5	102.8	105.9	104.9
0 - 99	107.9	105.6	109.4	115.8	112.5
100 - 249	100.8	99.6	101.5	101.8	100.0
250 - 499	107.5	102.6	103.8	104.1	102.5
500 and over	95.4	90.2	99.5	102.2	102.6
Electrical machinery	114.5	103.9	106.5	107.4	104.3
0 - 99	139.4	118.1	114.4	115.8	108.3
100 - 249	121.9	108.7	112.2	111.1	108.7
250 - 499	118.6	106.6	109.6	109.8	107.8
500 and over	109.2	100.7	104.1	105.3	102.5
Electrical generating, transmission, distribution, and industrial apparatus	104.6	97.7	100.8	102.5	99.8
0 - 99	126.8	112.9	108.3	111.1	108.5
100 - 249	108.3	103.5	106.8	105.0	104.5
250 - 499	110.5	105.3	105.6	104.6	102.2
500 and over	98.5	92.6	97.7	100.0	97.0
Electrical appliances	113.6	93.5	99.7	103.2	103.1
0 - 99	149.9	110.9	114.1	118.8	91.1
100 - 249	113.4	95.0	95.3	96.4	106.9
250 - 499	152.7	116.6	137.1	144.8	141.9
500 and over	99.8	85.6	89.9	92.6	95.3
Insulated wire and cable	112.9	101.5	108.8	108.8	105.3
0 - 99	130.8	115.5	120.7	124.6	118.6
100 - 249	118.8	101.0	115.0	114.2	108.1
250 - 499	114.6	100.8	107.5	107.0	104.9
500 and over	104.2	98.7	104.3	104.3	101.0

See footnotes at end of table.

Table 4 - Index of Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued
(July 1951 = 100.0)

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Electrical equipment for vehicles	100.9	94.9	100.9	102.0	102.2
0 - 99	(1/)	(1/)	(1/)	(1/)	(1/)
100 - 249	89.9	87.2	97.3	95.5	100.4
250 - 499	111.2	107.0	103.6	111.2	108.7
500 and over	101.3	95.0	101.2	102.0	101.9
Electric lamps	69.4	72.7	80.9	90.4	97.2
0 - 99	(1/)	(1/)	(1/)	(1/)	(1/)
100 - 249	(2/)	(2/)	(2/)	(2/)	(2/)
250 - 499	79.1	81.9	89.3	96.0	103.2
500 and over	65.7	69.7	78.5	89.7	96.5
Communication equipment	135.5	118.2	118.8	117.9	111.6
0 - 99	180.5	138.8	133.4	130.7	112.3
100 - 249	147.6	122.8	129.4	128.0	119.0
250 - 499	130.3	111.8	114.7	114.4	109.9
500 and over	130.4	116.9	116.9	116.1	110.9
Miscellaneous electrical products	106.8	102.6	101.5	100.6	101.5
0 - 99	118.1	112.1	111.8	111.1	109.5
100 - 249	113.4	105.6	91.1	92.8	95.4
250 - 499	114.4	106.0	105.6	98.7	103.6
500 and over	100.2	98.7	100.8	101.3	100.8
Transportation equipment	116.3	101.5	109.1	104.9	101.7
0 - 99	114.4	110.0	103.3	103.5	99.5
100 - 249	116.7	114.3	111.1	109.5	102.6
250 - 499	115.3	107.9	109.8	108.3	105.7
500 and over	116.4	100.2	109.2	104.5	101.6
Automobiles	104.1	81.5	98.2	94.4	98.1
0 - 99	95.3	98.9	95.0	100.0	94.6
100 - 249	105.8	100.9	101.6	103.3	100.9
250 - 499	98.3	90.7	96.9	97.9	100.7
500 and over	104.7	79.4	98.3	93.6	97.9
Aircraft and parts	133.6	128.6	122.8	118.2	103.8
0 - 99	138.8	119.9	114.5	109.3	103.2
100 - 249	142.8	142.0	128.6	126.4	113.2
250 - 499	200.6	180.1	157.0	142.6	119.4
500 and over	131.6	127.3	122.1	117.6	103.1

See footnotes at end of table.

Table 4 - Index of Total Employment in Selected Metalworking Industries, by Size Class of Establishment, Quarterly
October 1952 - October 1951 - Continued
(July 1951 = 100.0)

Industry and size class of establishment	All employees				
	October 1952	July 1952	April 1952	January 1952	October 1951
Ship and boat building and repairing	128.8	127.8	123.1	111.5	103.5
0 - 99	129.3	125.1	109.0	105.2	104.5
100 - 249	121.8	123.1	120.9	110.6	95.0
250 - 499	101.4	114.1	114.4	114.9	103.2
500 and over	132.4	130.3	126.4	112.2	104.6
Railroad equipment	121.1	108.8	123.8	132.1	131.5
0 - 99	94.6	85.9	99.2	93.3	104.3
100 - 249	87.3	109.3	104.4	102.9	102.9
250 - 499	105.3	91.3	110.2	112.2	121.5
500 and over	125.1	111.4	126.8	136.7	134.7
Other transportation equipment	124.3	111.5	103.7	103.6	107.6
0 - 99	99.1	94.8	95.1	101.7	99.9
100 - 249	117.8	104.9	102.8	100.2	100.4
250 - 499	(3/)	(3/)	(3/)	(3/)	(3/)
500 and over	137.6	121.5	107.4	106.2	114.6

1/ Because of the small size and high variance, the estimate for this stratum is not considered sufficiently reliable for publication. Although the industry total includes employment for establishments in this size group, data obtained by subtracting the sum of employment in the other size classes from the industry total will not necessarily yield an accurate estimate for the 0 - 99 size class.

2/ Data for this size class have been combined with those in size class 250 - 499 to avoid disclosure of establishment information.

3/ Data for this size class have been combined with those in size class 100 - 249.

APPENDIX

Reliability of the Estimating Process

All surveys, whether complete or sample, are to some degree imperfect. They are subject to errors of response, classification differences, editing, and other processing errors, and if sample surveys, to sampling errors. The BLS program adjusts for these imperfections at annual intervals by revision to bench marks furnished by the social security system. It is a very difficult task to analyze the total discrepancy into component parts, but that part which is sampling error can be measured.

The sample design for a 3-digit industry contains all establishments with more than 100 employees and a stratified random sample of single-unit establishments with less than 100 employees. This latter sample was drawn from the panel created by reconciliation of the 1950 annual Census of Manufactures with reports to the Bureau of Old-Age and Survivors Insurance. The panel was stratified into industry and size cells and sampling ratios were chosen so that the number of cases in the sample allocated to each cell was approximately proportional to total employment in the cell. Such ratios provided the optimum allocation of cases in the small-firm segment, thereby tending to minimize the variance of the sample estimates.

For this survey, the sampling error has been measured for the total for each 3-digit industry and for the various strata of small establishments. Similarly, measures of the sampling error have been obtained for 2-digit industries and for all metalworking industries combined.

The significant economic measurement provided by this new series is the trend in employment for the different size strata. There is no single economic definition of small-firm employment which is most useful for such a purpose. The definition chosen for this set of estimates establishes a level for January 1952. Since the important aspect of the estimates is their trend from quarter to quarter, it is the sampling accuracy of this trend that is measured. Specifically, it is the sampling error in the difference of total employment in two adjacent quarters related to the level of employment in the quarter from which change is measured. The error for production-worker estimates is approximately equal to the error in total employment estimates.

The relative standard of accuracy for trend presented in the tables below is for the 95 percent confidence interval. This means that 1 of every 20 estimates may have a larger error than shown in the table. On the other hand, for the remaining 19 estimates out of every 20 the error is distributed so that approximately 14 estimates are within the limits of one-half of the specified errors.

For the 3-digit estimates the industries have been grouped into three categories for each of which the approximate limit of error for 95 percent confidence is shown:

Percent Accuracy for 3-Digit Industries
Trend Between Adjacent Quarters

Number of employees	Group A industries	Group B industries	Group C industries
0 - 99	4	8	20
0 - 249	2	4	9
0 - 499	1	2	5
Total	0.7	1.0	2.0

The industries included in each group are shown in the following list:

Group A

	SIC CODE
Fabricated structural metal products	344
Construction and mining machinery	353
Metalworking machinery	354
Special-industry machinery (except metalworking machinery)	355
General industrial machinery	356
Miscellaneous machinery parts	359
Electrical generating, transmission, distribution and industrial apparatus	361
Insulated wire and cable	363
Ship and boat building and repairing	373
Other transportation equipment	375-379

Group B

	SIC CODE
Tin cans and other tinware	341
Cutlery, hand tools, and hardware	342
Heating apparatus (except electric) and plumbers' supplies	343
Metal stamping, coating, and engraving	346
Lighting fixtures	347
Miscellaneous fabricated metal products	349
Office and store machines and devices	357
Electrical equipment for vehicles	364
Electric lamps	365
Miscellaneous electrical products	369
Automobiles	371
Aircraft and parts	372

Group C

	SIC CODE
Fabricated wire products	348
Engines and turbines	351
Agricultural machinery and tractors	352
Service-industry and household machines	358
Electrical appliances	362
Communication equipment	366
Railroad equipment	374

The standard of accuracy provided by the total metalworking and 2-digit estimates is shown in the following table for the 95 percent confidence level:

Percent Accuracy for 2-Digit Industries
Trend Between Adjacent Quarters

Number of employees	SIC CODE				
	34	35	36	37	34 - 37
0 - 99	2.9	1.8	7.4	3.4	1.7
0 - 249	1.7	1.1	4.0	1.5	1.0
0 - 499	1.2	0.8	2.3	1.0	0.7
Total	0.7	0.3	0.8	0.1	0.2

Response Problems

Because of the sample design response problems fell into two groups:

1. Those concerned with establishments which fell into the 0-99 size class where specific schedules were needed in each cell, and

2. Those which fell into the other size classes where data for all firms employing 100 or more persons during the base period were needed.

For those establishments in group (1) which refused to report or for which the report reached Washington too late for tabulation a "substitution" was made. In the case of outright refusals, 3 percent of the reports solicited, where it was determined that the establishment will not report, a "permanent" substitution was made. This was done by randomly selecting another firm in the same size class and industry from a special panel of firms which had been reporting to BLS before August 1951, but which were not in the sample. The possible bias from this procedure is obviously very small.

Where reports were expected but were not received in time for tabulating, "temporary" substitutions were made. This was done by adjusting the size class cell for the number of reports not received. The tabulated totals for the size class cell were multiplied by a fraction, the numerator of which was the number of firms in the complete sample, and the denominator the number of firms in the available sample. Implicit substitution of this type was necessary for 12 percent of reports solicited.

For those establishments in group (2) which did not report, "temporary" substitutions were made as described above.

The influence of non-respondents on the estimates is minimized by the method of estimate which is used. For large firms, the method is the usual BLS procedure of link relatives computed from matched samples for adjacent periods. For small firms, a similar effect is obtained, and at the same time the possible bias of a ratio estimate in small cells avoided through a procedure which: (1) makes all computations from matched reporters for adjacent periods, and (2) calculates change (i.e. difference) in employment directly from the sample, obtaining the estimate for the current month by adding this change algebraically to the estimate for the previous month.

Significant Digits

All estimates of employment are shown in the tables in exact numbers of workers although not all digits of the numbers are significant. This manner of presentation has been adopted in order (1) to minimize the difficulties which might otherwise be encountered in 2-way summation of rounded numbers, and (2) to add precision to measures of percentage change in small cells.

BLS Report No. 6

Case study data on productivity and factory performance...

BEET SUGAR REFINING

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February 1953

STRENGTH FOR THE FREE WORLD
FROM THE
UNITED STATES OF AMERICA

PREPARED FOR THE MUTUAL SECURITY AGENCY
Productivity and Technical Assistance Division

BY THE UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

The collection of the data presented in this report has been made possible primarily through the generous cooperation of American manufacturers. In addition, the advice and assistance of many individuals in the industry, in trade associations and labor unions have been most helpful. The men who have contributed their time and technical experience deserve particular thanks. They have made available data and information on man-hours, output, factory operations, production methods, managerial practices, and machinery which represent the results of many years of research and observation.

Measures to increase the productivity of industrial enterprises and to enlarge the output of goods and services per unit of input have long been recognized as important factors in increasing the standards of living. Exchange of data on industrial productivity and factory performance has proved to be an effective approach toward improved efficiency. Suggestions for improved manufacturing techniques are most useful when they are based on the actual work experience of existing plants, as are the examples presented in this paper.

The term productivity is defined as the ratio between a given quantity of production (output) to one or another of the various input factors that are required for such production. As used in this paper the input factor concerned is labor, the most important and universal factor and the one that provides the most generally useful common denominator for comparing the efficiency of productive methods and techniques in different units of an industry or between the same industries in different geographic locations.

Low man-hours per unit are the result of many factors, most of which are difficult, if not impossible, to isolate and measure. Inherent differences in the dexterities and abilities of individual workers and in their health and strength affect their production. So may their attitudes, morale, and social purposes. These may be important, but in general the variations in man-hours required per unit among different factories are due primarily to the efficiency and condition of the equipment with which the workers are supplied, the layout of the factory which determines the efficiency of the flow of raw materials and goods-in-process, the skill of management in planning and directing production processes, the aggressiveness of management in creating consumer demand and developing effective marketing procedures, the design of the product, and the quality of the raw materials. Highest productivity can never be achieved when one or more of these factors is deficient.

The material in this report constitutes one aspect of the variety of services offered in the Technical Assistance Program.

Case Study Data on
Productivity and Factory Performance

BEET SUGAR REFINING

(Based on reports submitted
by six selected plants)

Prepared for

Mutual Security Agency
Productivity and Technical Assistance Division

by

United States Department of Labor
Martin P. Durkin, Secretary

Bureau of Labor Statistics
Ewan Clague, Commissioner

February 1953
Washington, D. C.

The new Bureau of Labor Statistics Reports series combines in a single sequential numbering system the several special numbering systems previously used on non-periodical mimeographed and multilithed publications not offered for sale by the Superintendent of Documents.

For the convenience of persons who received material regularly under any of the abandoned series, items issued as BLS Reports for a time will also be identified by their former series number.

In addition to the BLS Reports series, the Bureau also issues numbered bulletins, offered for sale by the Superintendent of Documents, and numbered reprints from the Monthly Labor Review.

Case Study Data on
Productivity and Factory Performance

BEET SUGAR REFINING

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no. 6

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FOREWORD

The primary object of this report is to be of use to production managers, superintendents, and methods engineers who are concerned with production problems. It is further hoped that the general discussion of productivity and the presentation of man-hours per unit in the refining of beet sugar will be of interest to government, labor, and trade association officials. By examining this report plant officials will be able to compare manufacturing operations in their plants with the operations in one or more of the plants in this study.

Description of Report

This report is divided into three chapters. Chapter I is directed primarily to the reader who is interested in productivity but not in the technical details. Chapter II contains detailed case studies of each plant and will be of value to the plant superintendent or the production engineer. Chapter III is a brief discussion of labor policies and relationships in the industry, together with some case studies of labor adjustments to technological changes. The appendixes contain statistics about the industry, detailed information on how the data were collected, a copy of the questionnaire used, and a glossary of trade and technical terms.

The information and data used for the case studies were obtained from plant records and from plant officials by representatives of the Bureau of Labor Statistics who visited each plant. Supplementary information was obtained from other Government agencies and trade associations. Appendix II contains information on data collection.

How To Use This Report

In using this report the following procedure is suggested to plant officials:

1. The plant official should refer to table A on page 4, to identify the United States plants in this study whose employment, production volume, and integration most nearly approach the situation in his plant. For a breakdown of the manufacturing process into machinery used and man-hours for specific operations, the official should refer to the tables and text in chapter II.

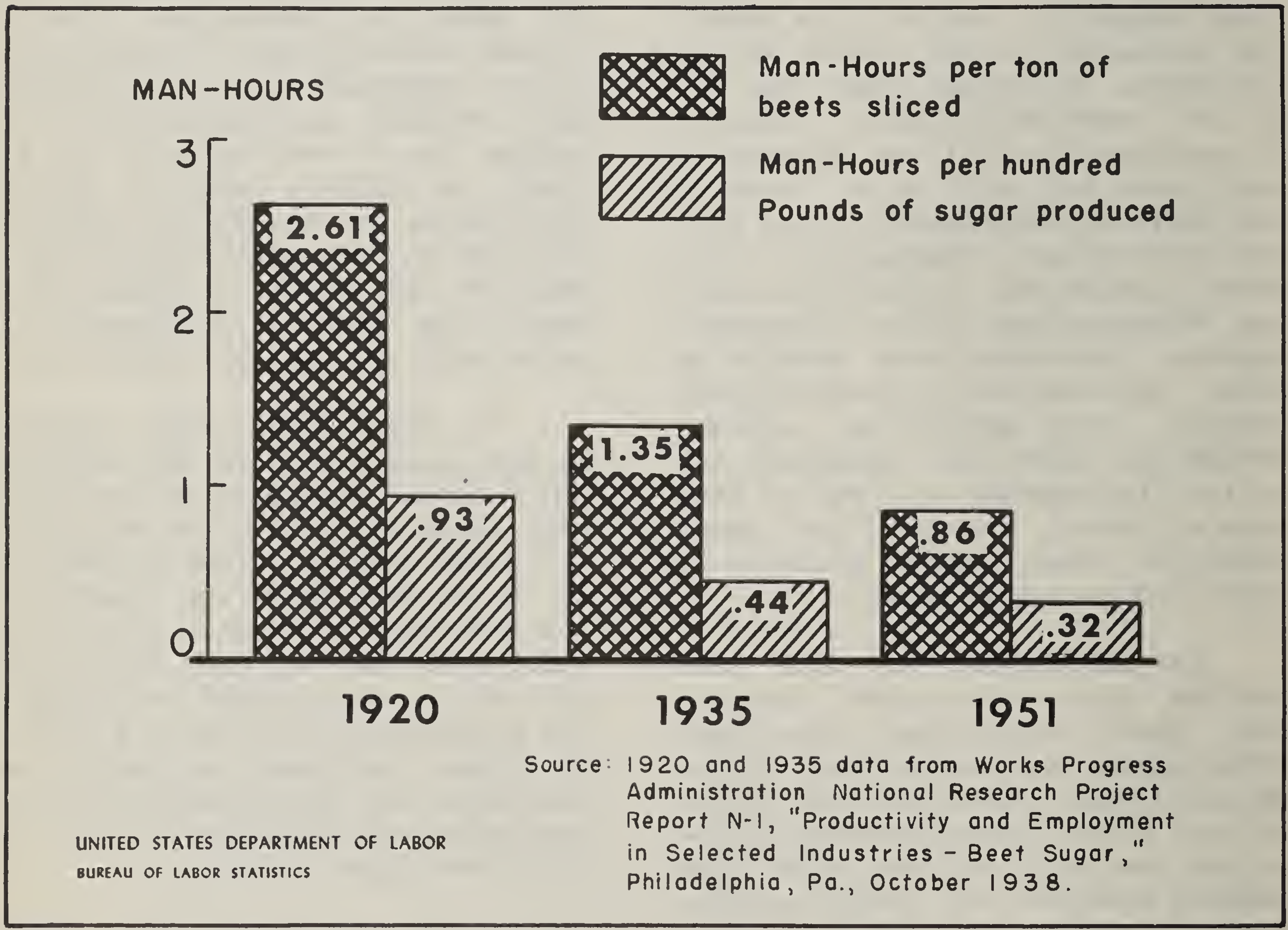
2. Appendix II contains a reproduction of the questionnaire used to obtain the information from the United States plants in this study. If the European production official will use this questionnaire to calculate labor requirements in his plant, he will be able to compare performance in his plant with performance in the plants discussed in this report, and to isolate areas where his plant's performance is relatively good or relatively poor.

3. The European plant official is now ready to compare the machinery and methods described in the report with those existing in his own plant, for those problem areas he has isolated. At this point the report does not give him the precise engineering information he may need but it does tell those familiar with the industry the approximate requirements in terms of volume, methods, machinery, and man-power for approaching the productivity levels illustrated in the individual case studies.

4. For serious problem areas uncovered in this manner, the expert

assistance of engineers, either those within his plant or outside consultants, will be needed. Intensive study must generally be made to correct the conditions found by comparison because these reports do not replace on-the-spot engineers or other specialists, in the analysis of specific situations.

In summary, this report may be likened to a series of gages or meters from which one may measure productivity or factory performance. Unlike most gages, which do not reveal the factors causing their recordings, factory performance studies indicate causes as well as symptoms by giving facts about the technological environment existing at the factories where data were collected. These facts, when studied by a technician familiar with the industry, can be of assistance in efforts to correct the conditions indicated by the reading on the gage.



Source: 1920 and 1935 data from Works Progress Administration National Research Project Report N-1, "Productivity and Employment in Selected Industries - Beet Sugar," Philadelphia, Pa., October 1938.

Fig. A Comparison between man-hours per ton of beets sliced and man-hours per 100 lbs. of sugar produced.

Case Study Data on
Productivity and Factory
Performance

BEET SUGAR REFINING 1/

CHAPTER I: GENERAL REPORT

Introduction

Almost a fourth of the sugar consumed in the United States is made from sugar beets, grown by about 60,000 farmers and processed by 19 companies operating 80 refineries with a total daily slicing capacity of 148,350 tons of beets.

The beet sugar industry has steadily reduced the number of man-hours required to process a ton of sugar beets. Although the efficient utilization of capacity and the labor force is largely dependent upon the size and quality of the beet crop, technological improvements effecting more continuous and automatic operations have resulted in reductions in labor expended per ton of beets sliced from more than two man-hours in 1920 to less than one in 1951. Total employment in November 1950 was 24,383, a reduction of more than 10,000 since November 1920. Production of beet sugar in 1950 was 1,637,741 tons 2/ an increase of about 600,000 tons since 1920.

For many years the two refining processes of diffusion and slicing had been relatively inefficient and created waste due to prolonged storage. In recent years, however, much man-hour savings have resulted not only from improvements in these two processes but also from an increased mechanization in handling beets, white sugar, and pulp, and the addition of automatic control devices. Despite improvements in refinery equipment, man-hour requirements per ton over a number of "campaigns" or seasonal production periods are closely related to fluctuations in beet production. Harvested acreage, in turn, is fairly sensitive to competition from other crops, and is subject to fluctuation in labor supply, weather, and the government quota and support system. Man-hour requirements for the six plants surveyed in this report reflect difference not only in equipment used, but also in the volume of operations, degree of beet purity, and labor conditions.

Improvement in equipment and methods in individual plants is the outstanding factor contributing to savings in labor requirements for the industry as a whole. Studies of a large number of plants, 3/ however, indicate that in many instances labor productivity, or the efficient use of labor, is as equally an important factor and feature in efficient plants as are

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1/ Prepared by Robert T. Kinsley, of the Bureau's Division of Productivity and Technological Developments.

2/ Production figure from Production and Marketing Administration, U. S. Department of Agriculture.

3/ Adamson, R. K. and West, M. E., Productivity and employment in selected industries: Beet Sugar, Works Progress Administration, National Bureau of Economic Research, Report N-1, p. 101, Philadelphia, Pennsylvania, October 1938.

large size, a high degree of mechanization, up-to-date equipment, and centralized, multiplant management. These studies concluded that: (1) relatively large capacity or high daily slicing rate is a major reason for the reduction of average man-hours required per ton; (2) there is a trend toward larger capacity by all plants; and (3) the increase in capacity is mainly the result of better use of labor, machinery, and equipment rather than extensive installations of new equipment or the building of larger plants. This generally has resulted from the elimination of process areas of small capacity and substitution of electrical control mechanisms for hand labor. The gradual and uniform improvement which has taken place in most plants has been hastened largely by the high degree of centralization of management. The five largest companies, controlling more than 70 percent of the production, have been able to pass on improvements developed in individual plants for the benefit of all plants in the organization. The six plants surveyed in this report are members of such multiplant organizations, and as such, exhibit many similar features. For this reason, complete equipment detail is given for only two plants, although man-hours required per ton of beets sliced and per hundred pounds of sugar produced are shown in as much detail as possible for all plants in the second chapter of the report.

Beet Sugar Refining Process

The extraction of pure sugar from sugar beets may be briefly summarized by the following steps: beet cleaning and slicing, diffusion, juice purification, evaporation, and crystallization. Many refineries perform additional operations such as recovery of additional sugar from molasses, recovery of byproducts, and pulp preparation.

Cleaning and slicing. Beets are conveyed from storage areas to the factory through flumes filled with running water. The flow of beets, controlled by a beet feeder, passes through various cleaning devices such as trash remover, stone catcher, and beet washer. The cleaned beets are then fed into the interior of a rotary drum slicer where they are cut into thin, V-shaped strips called cossettes. Some factories use a scale which automatically weighs the cossettes, controls the beet-slicer speed, and regulates the flow of battery supply water and of cossettes in a continuous diffuser.

Diffusion. The removal of sugar from the cossettes in either batch-type or continuous diffusers is performed by the circulation of hot water about the cossettes in a series of 14 or more cylindrical cells. The resulting diffusion juice contains about 12 percent dissolved solids, composed largely of sugar and other soluble substances such as minerals, proteins, and organic acids. The remaining pulp, or cossettes with sugar removed, is used for cattle feed. Pulp water from batch-type operations is usually sent to waste. By 1951 about 20 percent of the refineries had installed continuous automatic diffusion systems, thereby eliminating the labor-consuming operations involved in filling and emptying the cells of the battery. In addition to saving work, the continuous diffuser gives a more complete extraction of sugar from the cossettes, the diffusion juice is more concentrated, and the pulp is better drained and ready for processing for stock feet.

Purification. Impurities are removed from the diffusion juice by either batch type or continuous carbonation systems. In the first carbonation, milk of lime is added to the juice which is then treated with carbon-dioxide gas. Both the lime and the gas are produced at the factory by burning limestone. The precipitate is separated and the juice recarbonized and filtered. The second carbonation juice is treated with sulfur dioxide gas and again filtered.

Evaporation. The thin, clear juice from the conventional carbonation process is heated in multiple-effect evaporators which remove most of the water and leave a thick liquor. Some evaporators are equipped with a photo-electric cell which warns of excessive foaming. The liquor is filtered through a powered mineral to remove the last trace of suspended impurities. In the 1948 "campaign" in the United States, 45 percent of the refineries reported the use of activated carbon for filtering, in amounts ranging from 0.002 to 0.39 pounds per 100 pounds of refined sugar produced.

Crystallization. White sugar is crystallized from the filtered liquor by boiling at low temperature and high vacuum until the water is removed and crystals have grown to the proper size. The sugar is separated from the impure sirup leaving the vacuum pans by washing with hot water in centrifuges. The sirup from the centrifuges is reboiled under vacuum to obtain additional crystalline sugar. The sirup from the second boiling is also boiled and the resultant sugar returned to an earlier part of the process. The sirup from the final boiling is molasses. Some refineries employ the Steffens process (described in chapter II) to obtain additional sugar from the molasses. The waste from this process is valuable as a source of monosodium glutamate.

Packing. The sugar crystals, now separated from the sirup, are dried in granulators, screened, sized, and packed in a variety of sizes of containers, the most common being the 100-pound bag. Very little beet sugar is formed further into powdered or tablet sugar.

Plant Characteristics

The six plants selected for this report are representative of the beet sugar industry in the United States in terms of size, age of equipment, location, and type of production methods. Detailed data on plant characteristics and certain operations have been omitted to avoid identification of the individual plant. Complete equipment lists, employee staffing pattern, and man-hours required for each operation are shown, however, in chapter II of this report.

All plants are members of large multiplant companies which provide purchasing, sales and administrative functions, and research and analytical control methods. Plant A has a slicing capacity under 2,000 tons per 24-hours, Plants B through E have capacities of about 3,000 tons, and Plant F has a slicing capacity of more than 3,000 tons. One plant is equipped to use the ion exchange process, although it was not in use at the time of the survey. Two plants extract additional sugar from molasses by the Steffens process. Both the ion exchange and Steffens processes are described in chapter II.

Man-hour Requirements

The labor requirements of the six plants range from 0.624 man-hours per ton of beets sliced for Plant E to 1.293 man-hours for Plant F (table A). The efficiency of Plant E is the result of its up-to-date continuous and automatic equipment and controls, which are described in detail in the introduction to chapter II. By comparison, the larger number of man-hours of Plant F include certain operations not performed by Plant E and other plants. The man-hours, however, also reflect difficulties in beet receiving, high maintenance hours, and more man-hours at some operations as a result of older equipment. The remaining plants have similar total labor requirements, yet indicate some differences among individual operations. Most of these differences are the result of the equipment employed. Where possible, this is noted in chapter II.

Table A. Man-hour requirements per ton of beets sliced and per hundred pounds of sugar produced, by type of labor, in 6 selected beet sugar refineries, U. S. A., 1951

Type of labor	Plant					
	A	B	C	D	E	F
	Man-hours per ton of beets sliced					
Total factory labor . . .	0.887	0.730	0.727	0.886	0.624	1.293
Direct labor	.538	.463	.442	.588	.400	.913
Indirect labor	.349	.267	.285	.298	.224	.380
	Man-hours per hundred pounds of sugar produced					
Total factory labor . . .	0.329	0.283	0.259	0.348	0.232	0.486
Direct labor	.200	.179	.158	.231	.149	.343
Indirect labor	.129	.104	.101	.117	.083	.143

Case Study Data on
Productivity and Factory Performance

BEET SUGAR REFINING

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CHAPTER II: DETAILED CASE STUDY DATA

Collection and Presentation of Data

The detailed information in the text and tables of this chapter is intended for the use of technical readers. A questionnaire was prepared with the advice and assistance of authorities in management, labor, and trade associations. These forms were then taken to cooperating companies where data were gathered by conferences with company officials and from company records. The man-hours by operation were derived in most cases by multiplying the number of workers at each work station by the "campaign" hours worked. Although labor requirements are generally expressed in terms of units of output, the requirements for this industry were also measured in terms of the quantity of raw material consumed. The ratio "man-hours expended per ton of beets sliced" is in many cases more useful than the ratio "man-hours expended per 100 pounds of sugar produced." The quantity of sugar produced is influenced by the sugar content of the beets processed, with the result that the labor actually expended in a refinery bears a closer relationship to the quantity of beets sliced than to the quantity of sugar produced.

Man-Hour Requirements

The number of man-hours required to process a ton of sugar beets and to produce a ton of sugar are shown by type of labor and by operations in the following tables.

With certain exceptions (such as ion exchange, an operation not used in 1951 by any of the surveyed plants) the operations in beet sugar refining are identical in all plants. Differences in the man-hour requirements per ton may be attributable in most cases to the type of equipment used, the number of employees at each operation and in maintenance functions, and to operations such as the Steffens process which is not performed in all plants. The labor requirements do not include man-hours of persons engaged in office work, purchasing, selling, and other general administrative duties, or of persons in the parent company offices or testing and research laboratories. The number of employees at each operation is generally largest on the first shift (table 6), and is considerably reduced for the two following shifts, particularly in maintenance functions.

Operations in a Typical Plant

New continuous type equipment, automatic instrument controls, and coordination in steam and vapor use have reduced the total labor requirements of a modern American beet sugar refinery to less than 15 man-minutes per 100-pound bag of white sugar. This may be illustrated by a summary of the operations of Plant E, which operates at a daily slicing rate one-third greater than designed capacity, and has the least number of man-hours required per ton of the plants surveyed in this report. Because of the location of the refinery in an area where high temperatures do not allow long storage of the beets, both speed and coordination of beet slicing to receipt of beets and oversize equipment at critical points were necessary. The following is a brief summary of the processing steps, with attention given to certain features of the equipment and instruments of this refinery.

A maximum of 4,500 tons of beets a day are delivered by railroad cars and trucks, weighed, tested and pumped by two 5,000 gallon-per-minute pumps through flumes to the next process. About 60 percent of the flume water is recirculated. After washing and trash removal, the beets pass over a magnetic pulley which removes tramp iron, and are fed to four Ogden slicers. The battery operator coordinates the speed of the slicers to the requirements of the diffuser. These slicers are each driven by a 50 hp. gear-reduction motor and can be varied in speed from 60 to 120 r.p.m. A Merrick Weightometer automatic recording scale weighs the cossettes entering the diffuser and simultaneously regulates the amount and flow of water and its temperature (140° F) to the diffuser (fig. 1).

The diffuser is a Silver 21-cell continuous type, one of 16 in use in the industry. The unit is installed in 2 banks, 9 cells over 12 cells, through which perforated steel shelves move, driven by 10 3-horsepower direct current motors. The unit is operated by only one man, a saving of about 168 man-hours per 24 hours over conventional batch-type units. The diffuser extracts about 98 percent of the sugar present in the beets in a cycle time of about 80 minutes, at a uniform automatically controlled temperature (70°C).

(Although most refineries use either the Silver continuous diffusion system as described for this plant or the Roberts batch-type system, another type used is the Oliver-Morton continuous diffusion process. This system consists of a line of 24 to 28 tanks set at a slight incline through which water flows by gravity and cossettes are moved in the opposite direction by means of a scroll and lifter paddles. In using this method the loss of sugar was reported to have been reduced from 3.10 to 1.86 pounds per hundred weight. In addition, about 15 fewer pounds of juice, with a higher sugar content, is drawn off with resulting savings in fuel required for evaporation. Other advantages are low initial cost, simplicity of operation, and flexibility. The speed of drive and the number, size, and arrangement of cells may be changed to meet different requirements, and removable covers make all parts of the mechanism easily accessible for inspection or adjustment.)

Diffusion juice (about 14 brix) is pumped to heaters where its outflowing temperature is automatically controlled at 85-90°C. Tubes from these heaters are arranged so that they may be withdrawn singly to remove scale. Closed heaters are replacing open injection heaters because a closed heater prevents the condensate from diluting the sugar liquor and will operate on a lower pressure vapor. The heated juice then enters the continuous carbonation systems through a 14 foot-diameter Benning carbonator where the pH is automatically controlled. A Benning carbonator (fig. 3) replaces the first and second tanks in the conventional Dorr carbonation system, with savings in equipment cost and space occupied. However, there is a disadvantage in a single unit requiring the refinery beet end to be shut down if the carbonator becomes so scaled as to require cleaning. A typical automatic control system for the Dorr system of continuous first carbonation is shown in fig. 4. The glass-calomel electrode units develop a small voltage, determined by the pH and temperature of the solution, which is automatically and continuously recorded by a controlling potentiometer. The control unit regulates the addition of kiln gas or liming reagent. The gassed limed juice, under a pressure of 7 pounds per square inch, is clarified in a 28-foot Dorr thickener and heated by a third vapor to an automatically controlled temper-

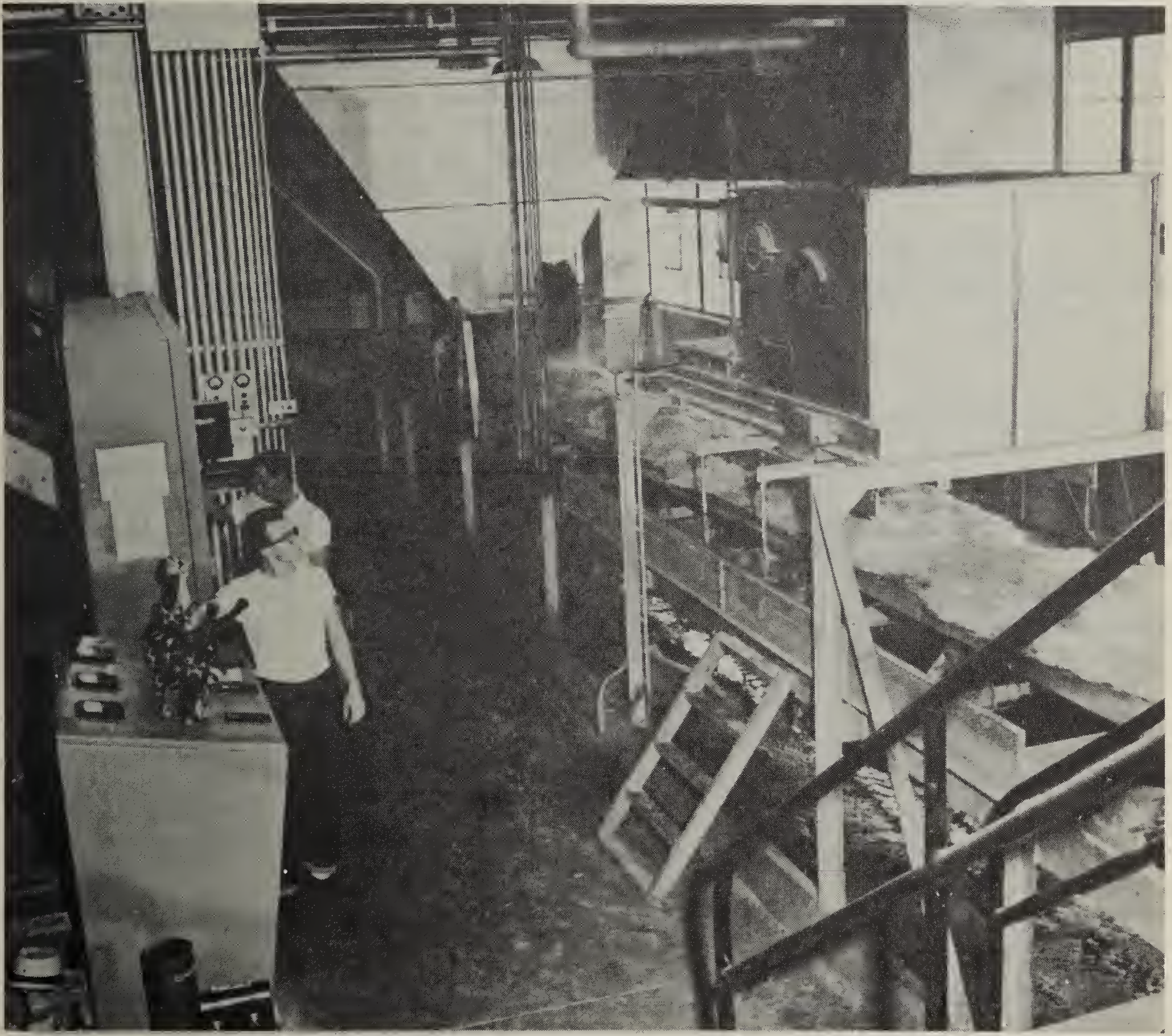

Fig. 1 Merrick Weightometer automatic scale.

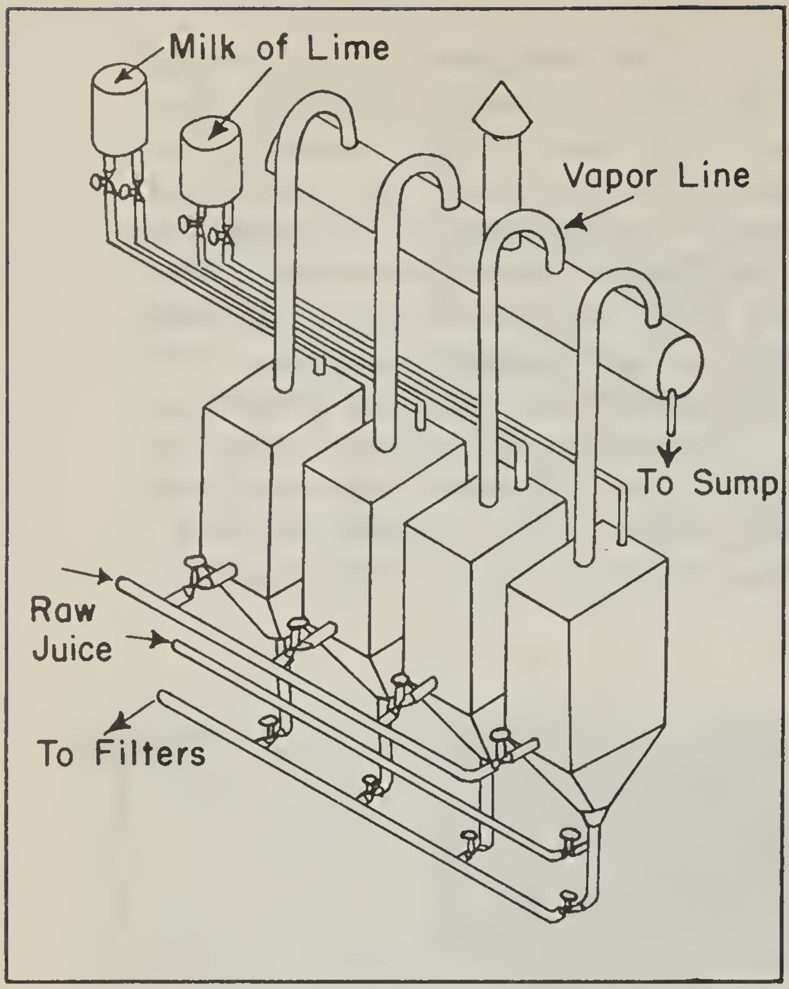

Fig. 2 Batch first carbonation station.

ature of 85°C. After the second carbonation in which the pH controller regulates the amount of gas introduced, the juice is filtered and pumped to the sulfur tower. The amount of sulfur dioxide gas introduced is automatically controlled by a pH instrument. The thin juice from sulfitation is pumped to a boiler where temperature (98°C) and juice level are automatically controlled, and to heaters (148° C). Continuous carbonation systems are now widely used and offer large savings in labor and maintenance over the older batch-type methods. In 1920 no known continuous systems were in use in the United States; in 1947 more than 66 percent of the refineries had continuous first carbonation and more than 94 percent had continuous second carbonation. Because of transportation costs if the refinery is located at a distance from the supplier, sul-

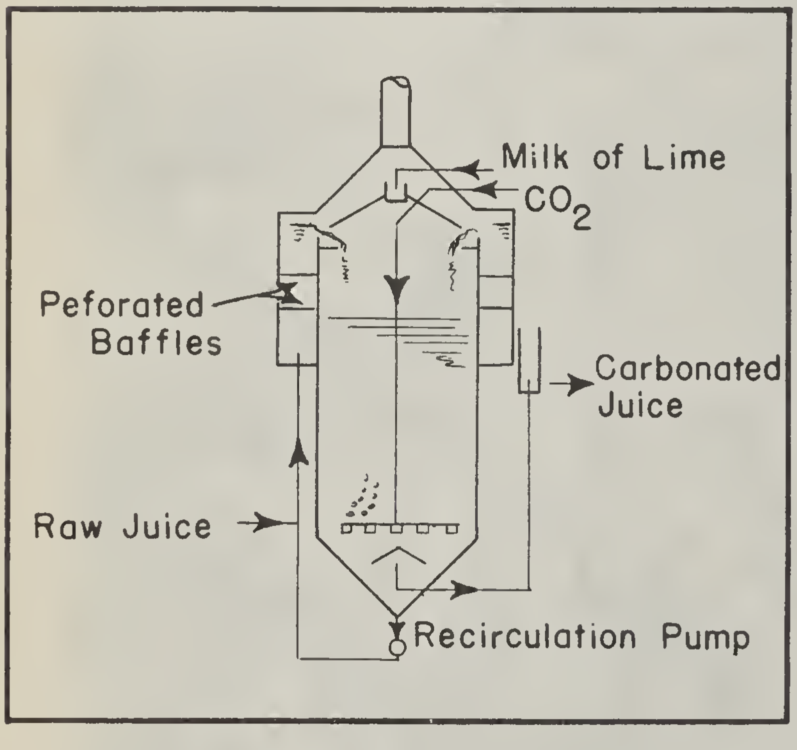

Fig. 3 The Benning carbonator.

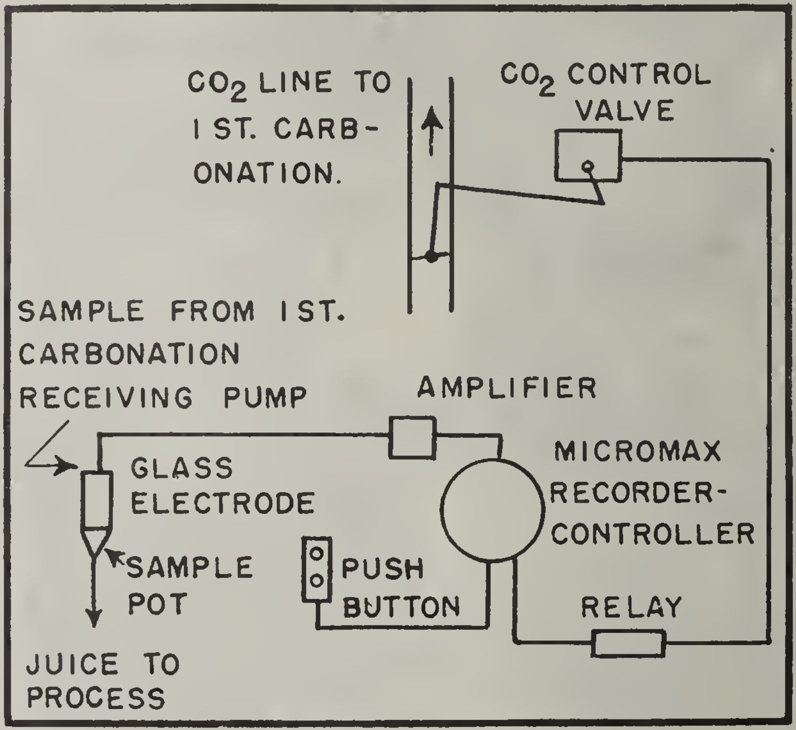
CO_2 LINE TO 1 ST. CARBONATION.
CO_2 CONTROL VALVE
SAMPLE FROM 1ST. CARBONATION RECEIVING PUMP
AMPLIFIER
GLASS ELECTRODE
MICROMAX RECORDER-CONTROLLER
SAMPLE POT
PUSH BUTTON
RELAY
JUICE TO PROCESS

Fig. 4 Schematic diagram of typical central system for Dorr continuous first carbonation.

furing by the addition of liquid sulfur dioxide is seldom used, although the method eliminates many of the difficulties arising from the use of the sulfur stove (fig.6).

The Swenson, five-effect long-tube evaporators using automatic pressure controls are so designed that the vapors provide heat for numerous other operations. The flow of juice (13.4 Brix) to the first effect is automatically controlled and constant juice levels are automatically maintained in all effects. The thick-juice effluent from the fifth effect is blended with centrifugal wash-sirup and high-raw melted sugar and is filtered in seven plate and frame filters (840 square feet each), using a refined diatomaceous filter aid (Johns-Manville High Flow Super Cell). The high-quality liquor goes to a storage tank (1,620 cubic feet capacity), also with automatic temperature control, from where it is drawn by vacuum to the two white pans (1,300 cubic feet each).

The calandria-type Stearns-Rogers vacuum pans have automatic pressure controls and vapors are

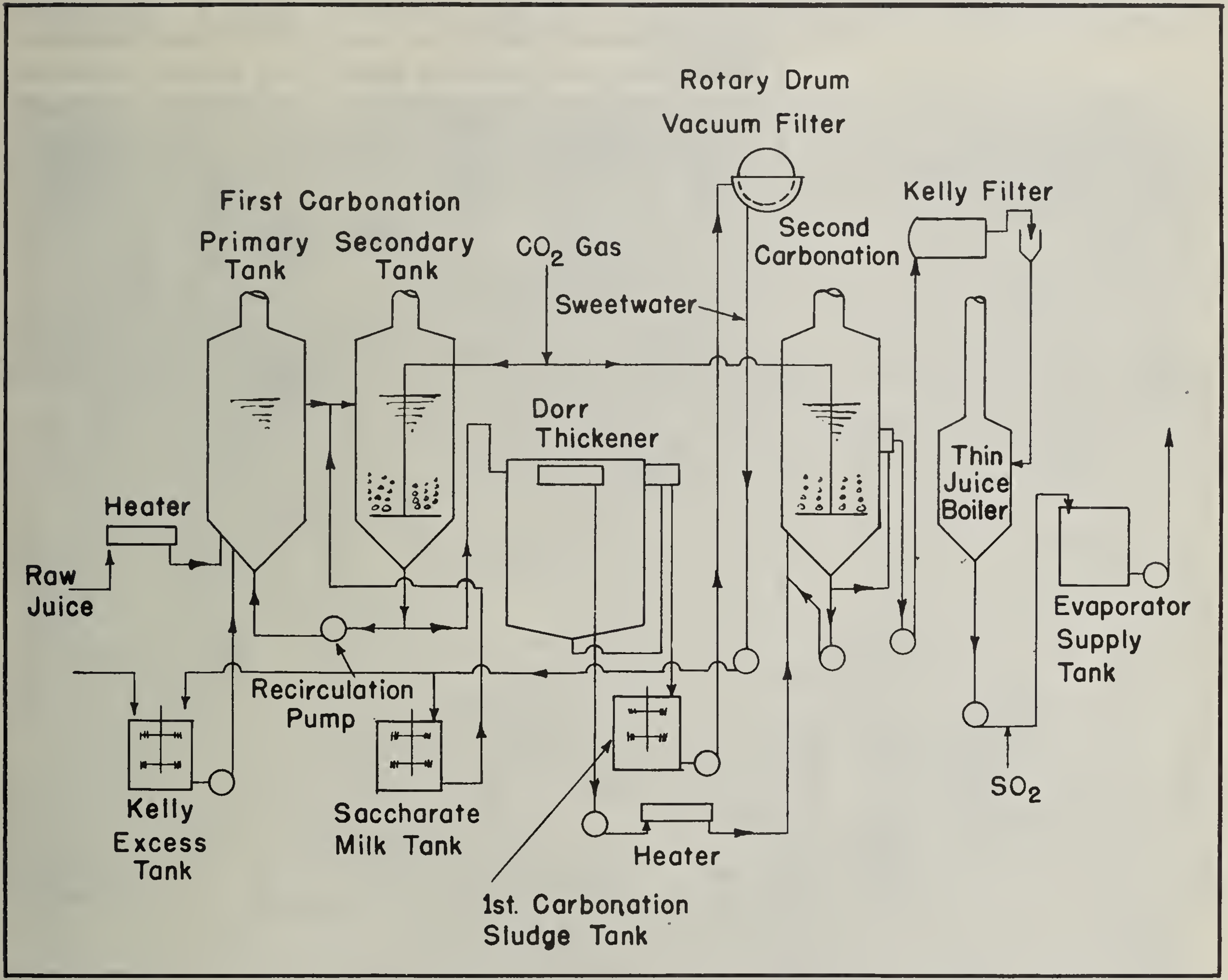

Fig. 5 Dorr system of continuous first and second carbonation.

Table 1. Man-hour requirements per ton of beets sliced and per hundred pounds of sugar produced, by type of labor, 6 selected beet sugar refineries, U. S. A., 1951

Type of labor	Plant					
	A	B	C	D	E	F
	Man-hours per ton of beets sliced					
Total factory labor . . .	0.887	0.730	0.727	0.886	0.624	1.293
Direct labor	.538	.463	.442	.588	.400	.913
Indirect labor	.349	.267	.285	.298	.224	.380
	Man-hours per hundred pounds of sugar produced					
Total factory labor . . .	0.329	0.283	0.259	0.348	0.232	0.486
Direct labor	.200	.179	.158	.231	.149	.343
Indirect labor	.129	.104	.101	.117	.083	.143

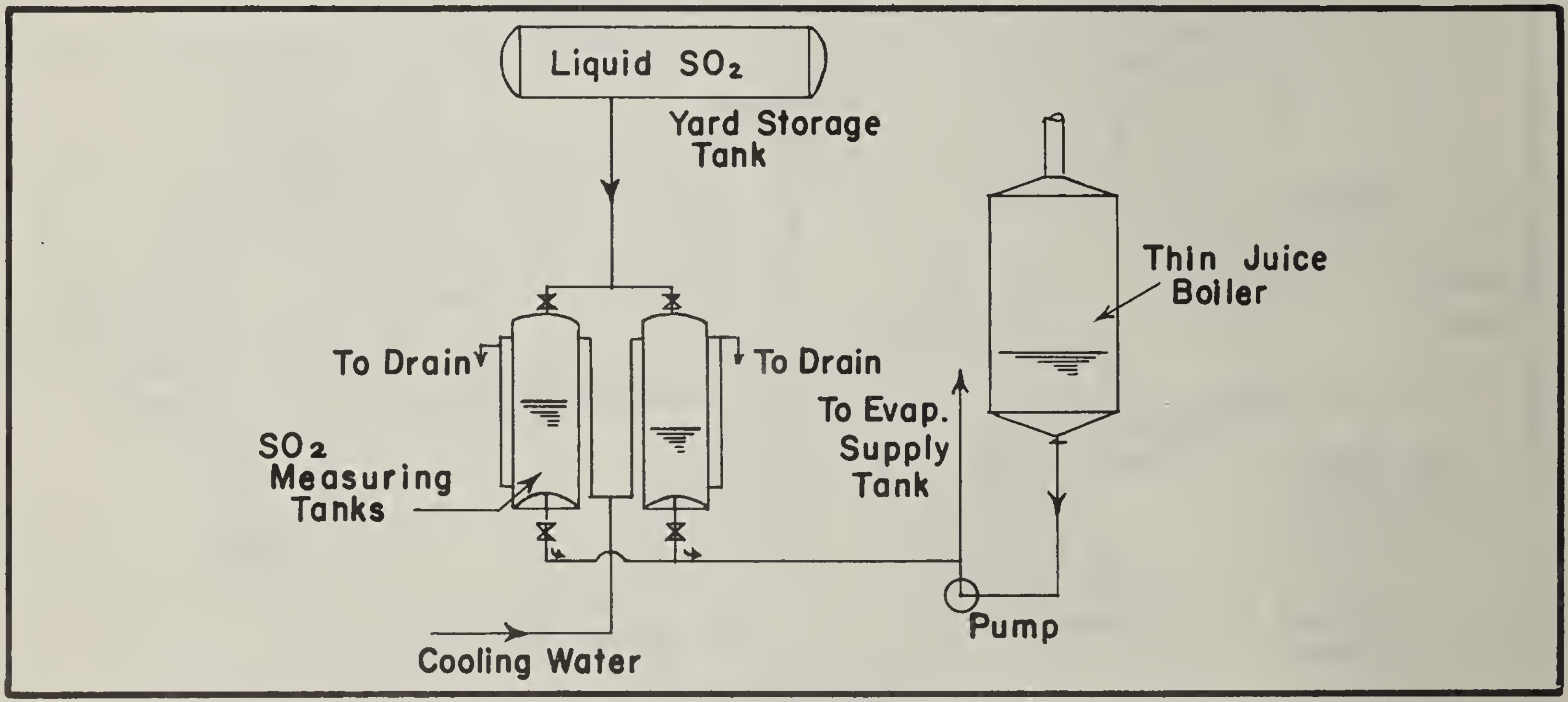

Fig. 6 Diagram of installation for the addition of liquid sulfur dioxide.

drawn off with automatically operated water-jet condensers. Calandria-type pans can operate on much lower steam pressure than coil pans. There is no successful type of automatic vacuum pan controller for beet massecuites which can cover all variables, although it is used in cane sugar refining. The massecuite from a strike flows to a mixer (1,300 cubic feet capacity) and then to six centrifugals.

The centrifugals are 40 inches in diameter, 30 inches deep, and run at 1,600 r.p.m., with individual motors and fluid clutch, completely automatic except for filling and discharging. In the companies surveyed in this report, two to three centrifugals are operated by one man who, in some cases, only pushes a button to load and start the cycle. The sugar is then conveyed (510 pounds per minute) by scroll and elevator to the wet sugar bin (30,000 pounds capacity) and then to a Rotolouvre granulator. Air, which is purified by ionization through a 13,000 volt, direct current grid Precipitron, enters the dryer at an automatically controlled temperature. In this type of dryer the air is forced through the sugar instead of the sugar being moved through the air, with a claimed increase in luster preservation.

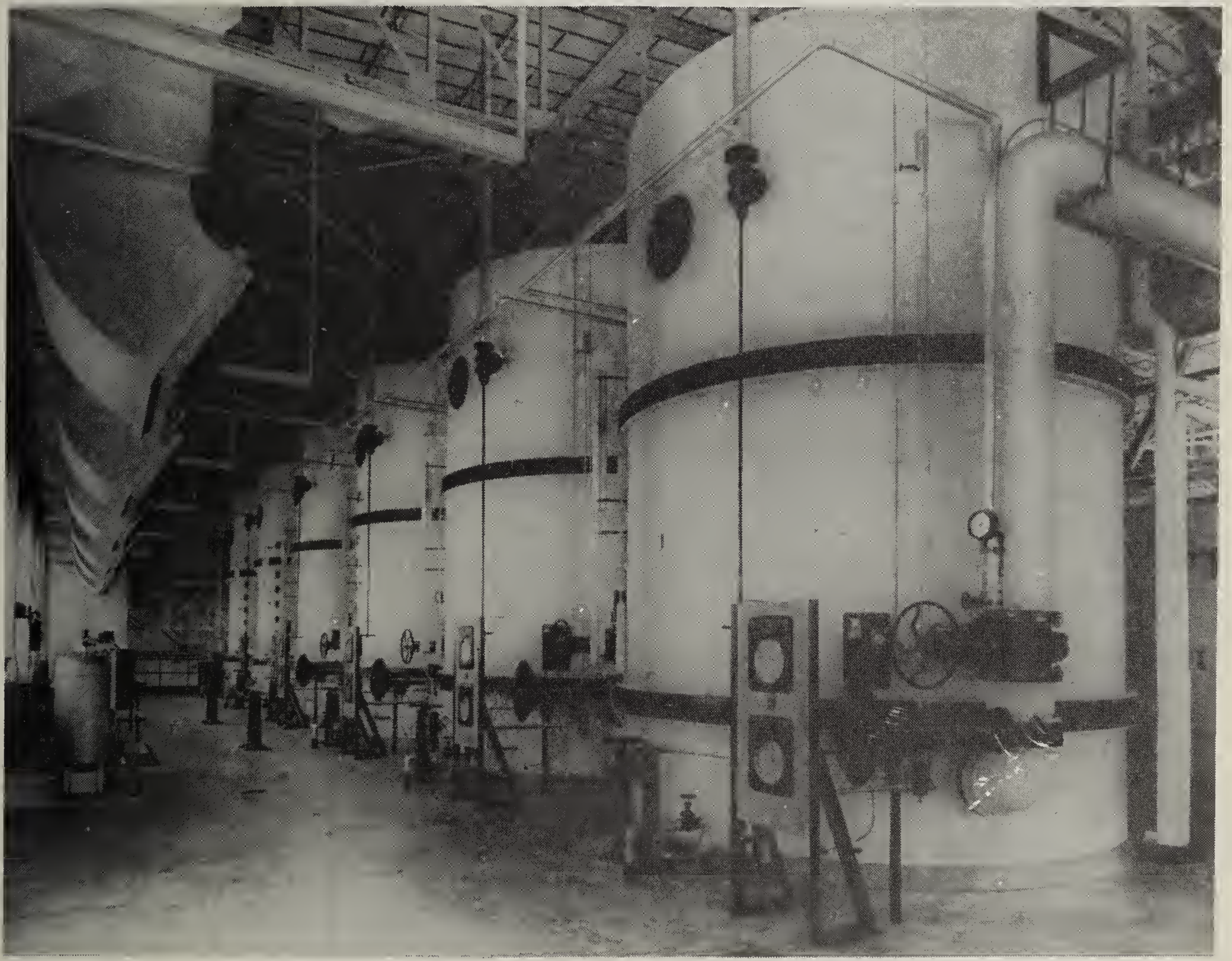

Fig. 7 Calandria-type vacuum pans with automatic controls.

The sugar is then elevated at a rate of 505 pounds a minute, screened, automatically weighed by 100 pound lots, and dumped into one of four cylindrical bulk bins each 50 feet in diameter, 106 feet high, and holding 10 million pounds. Air, dried by a calcium chloride dehumidifier, is circulated in the bins to maintain a low relative humidity.

Table 2. Direct man-hour requirements per ton of beets sliced by operation or labor account in 6 selected beet sugar refineries, U.S.A., 1951

Operation or labor account	Plant					
	A	B	C	D	E	F
Beet end:						
Receiving	0.020	0.026	0.061	0.029	0.021	0.077
Handling (flumes, trash catchers, beet washers) . . .	.121	.040	.062	.067	.040	.068
Slicing (weighers, knife filers, setters, picking table)	.045	.040	(1/)	.044	.040	(1/)
Diffusion (battery foremen, cell fillers, dumpers, pulp handlers).	.061	.008	.022	.055	.008	.114
Carbonators (sulfur burners, tankmen)	.015	.008	.008	.022	.008	.011
Filter pressmen, laundry men	.045	.072	.051	.077	.059	.112
Evaporators		.008	.008	.011	.088	.011
Utility men	.015	.021	.012	(2/)	.008	.030
Lime kiln	.030	.018	.044	.055	.024	.059
Reclaiming	(2/)	(2/)	(2/)	(2/)	(2/)	.019
Sugar end:						
Boilers, crystallizers, helpers	.030	.032	.032	.022	.027	.043
Granulators	.015		.009	.011	.008	.015
Centrifuges, melters	.045	.058	.066	.066	.048	.163
Utility men	(2/)	.013	.006	.004	(2/)	.015
Packing	.096	.119	.024	.125	.101	.081
Steffens operations	(2/)	(2/)	.037	(2/)	(2/)	.095
Total direct labor	.538	.463	.442	.588	.400	.913

1/ Included in handling.
2/ Operation not performed.

Table 3. Direct man-hour requirements per hundred pounds of sugar produced by operation or labor account in 6 selected beet sugar refineries, U.S.A., 1951

Operation or labor account	Plant					
	A	B	C	D	E	F
Beet end:						
Receiving	0.0075	0.0103	0.0216	0.0116	0.0079	0.0288
Handling (flumes, trash catchers, beet washers)	.0448	.0153	.0222	.0260	.0149	.0256
Slicing (weighers, knife filers, setters, picking table)	.0168	.0154	(1/)	.0173	.0149	(1/)
Diffusion (battery foreman, cell fillers, dumpers, pulp handlers)	.0224	.0031	.0080	.0217	.0030	.0428
Carbonators (sulfur burners, tankmen) . . .	.0056	.0031	.0239	.0087	.0030	.0504
Filter pressmen, laundry men	.0168	.0277		.0304	.0219	
Evaporators		.0031		.0043	.0030	
Utility men	.0056	.0082	.0044	(2/)	.0030	.0112
Lime kiln:						
Reclaiming	.0112	.0072	.0155	.0217	.0089	.0220
Sugar end:						
Boilers, crystallizers, helpers	.0112	.0123	.0114	.0087	.0099	.0161
Granulators	.0056		.0033	.0043	.0030	.0057
Centrifuges, melters . .	.0168	.0226	.0234	.0260	.0179	.0612
Utility men	(2/)	.0051	.0022	.0014	(2/)	.0056
Packing	.0355	.0462	.0084	.0491	.0378	.0305
Steffens operation	(2/)	(2/)	.0130	(2/)	(2/)	.0360
Total direct labor . . .	.1998	.1796	.1575	.2312	.1491	.3432

1/ Included in handling.
2/ Operation not performed.

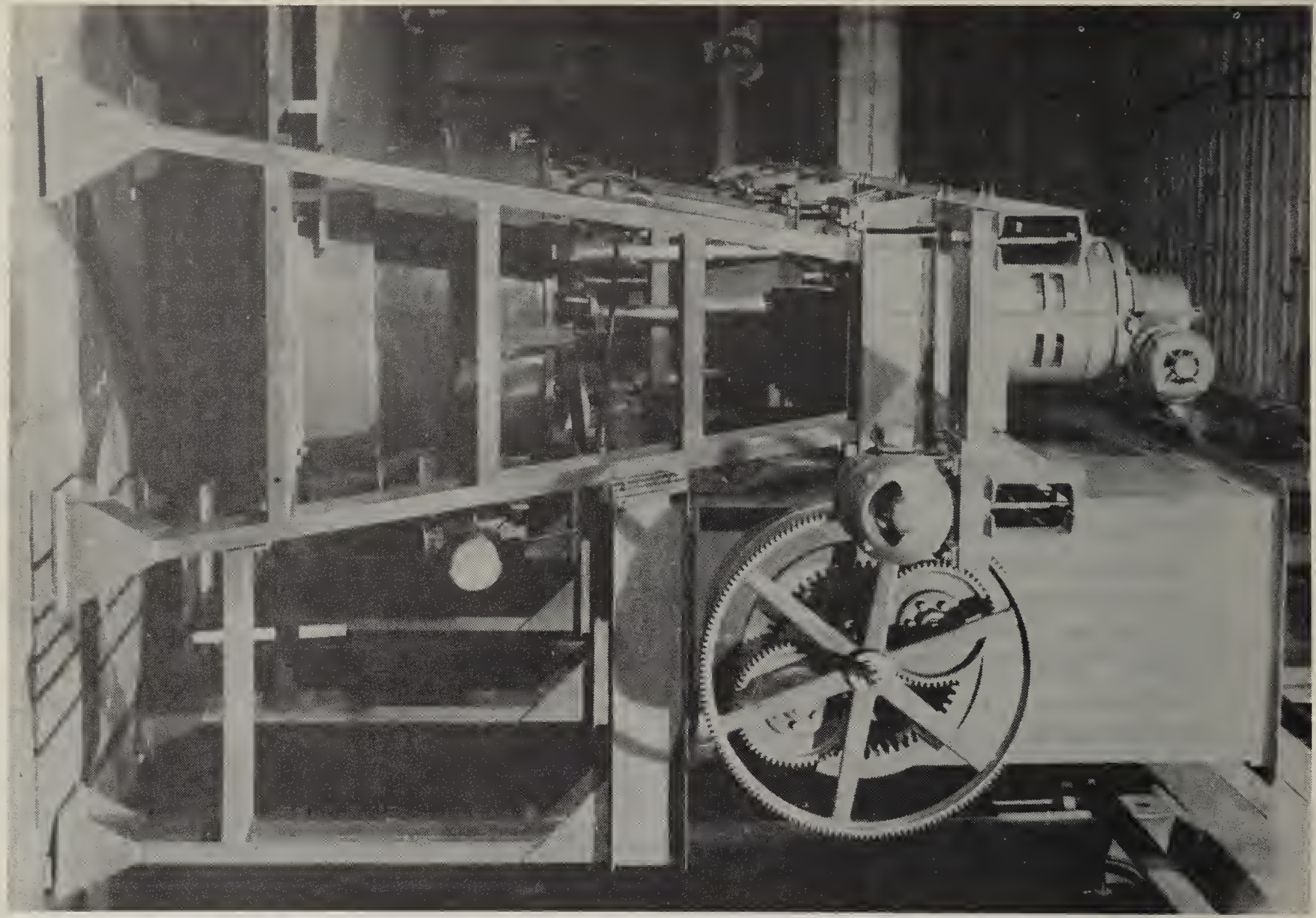

Fig. 8 Side view of centrifugal station.

White sugar is loaded in bulk on railroad cars or trucks, or packaged in 5-, 10-, 25-, or 100-pound paper or cloth bags. The St. Regis valve-type, 100-pound paper-bag packer eliminates the need for sewing or gluing. After the bag is filled it is removed from the spout and the paper valve is folded in, preventing leakage. One hundred pound bags may be packed with this apparatus at a rate of more than 500 bags an hour. Bags are conveyed by inclined belt elevators to the stacking level in the air-conditioned warehouse.

Plant E was the first refinery in this country to use only one steam generator, rated at 150,000 pounds of steam an hour at continuous operation. The unit burns about 4 million cubic feet of natural gas each 24 hours, and generates steam at 410 pounds per square inch at 575°F. High pressure steam is used for a 3,000 kilowatt turbogenerator, an Elliott blower, and the boiler feed pumps. The turbogenerator develops power at 2,300 volts for the 300 motors used in the plant, and is fractional to 250 horsepower. The Elliott blower draws and feeds the carbon dioxide gas at the rate of 5,500 cubic feet a minute. The beet slicers, requiring 2,500 pounds of steam an hour at 100 pounds per square inch at the knife-cleaning nozzles, and the LaFeuille crystallizers are the only units which do not derive steam from first evaporator effect. By means of automatic pressure controllers which add exhaust steam to prevent pressure drops, pressure is stabilized in the first three effects, thereby guaranteeing a constant supply of steam to equipment drawing on these units for heat. The fuel economy of a refinery is also influenced by the quality of

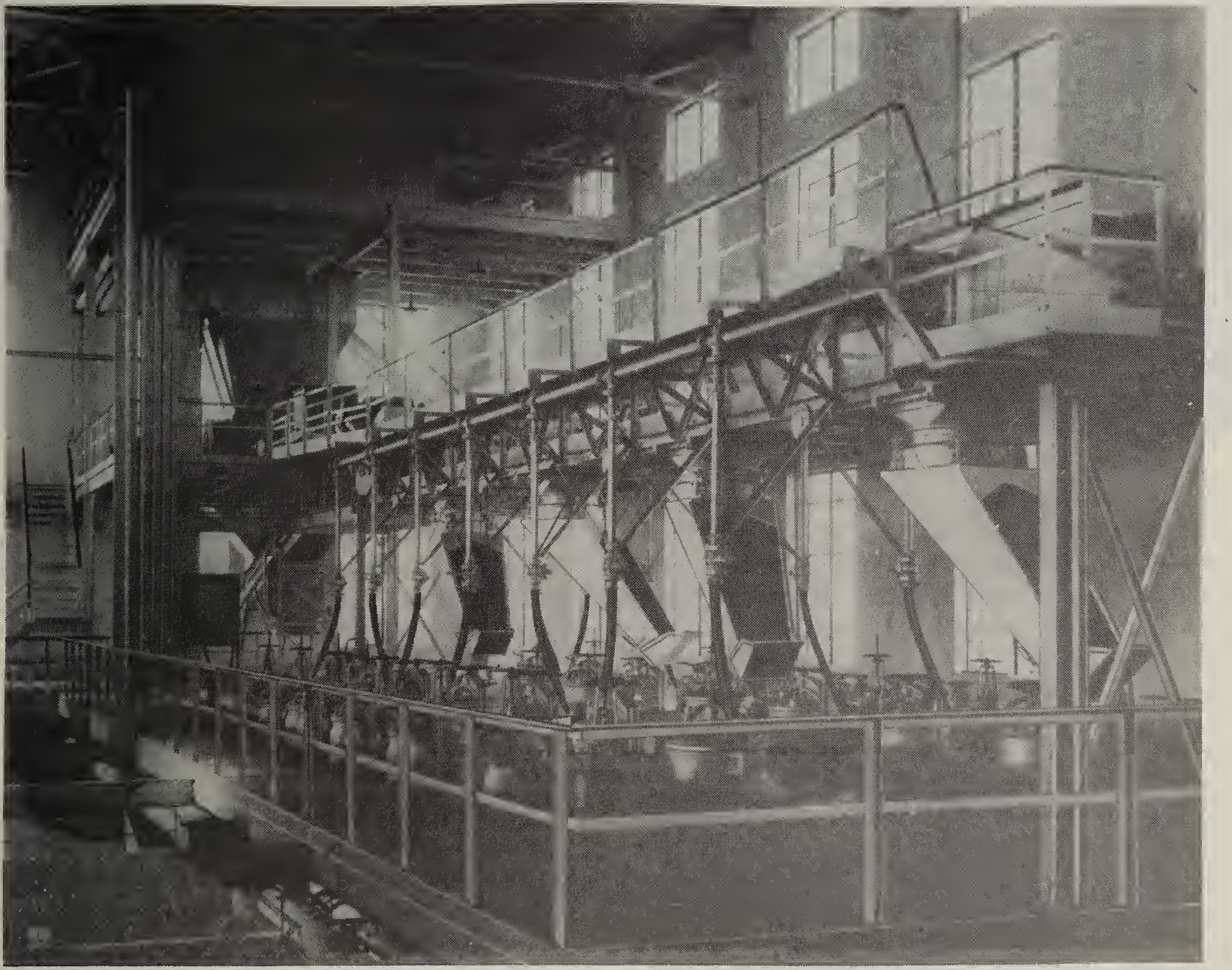

Fig. 9 Conventional diffusion battery station with cossette conveyor and distributors.

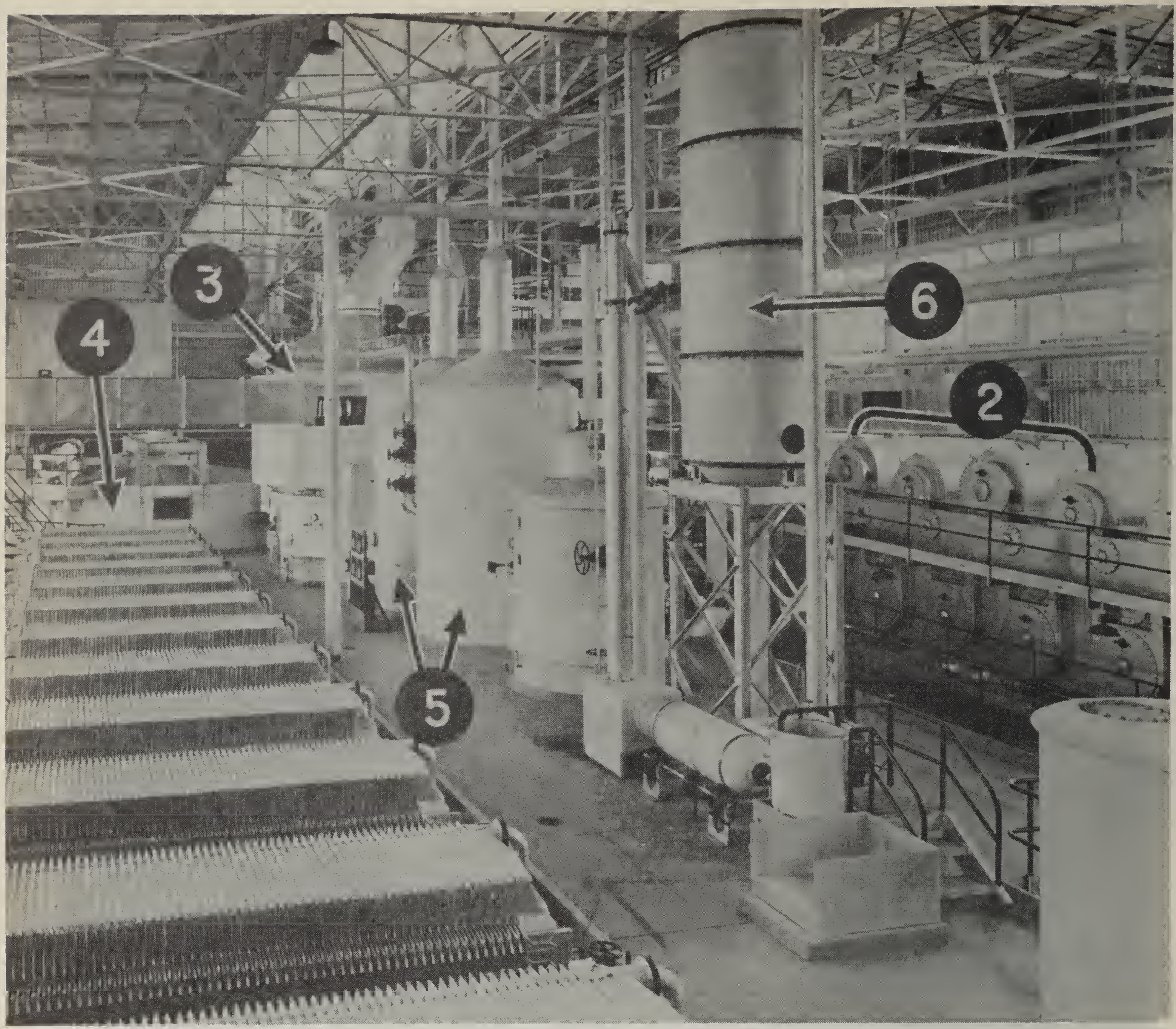

Fig. 10 Selected processing units: Silver continuous diffuser, Benning carbonator, Dorr thickener, Shriver plate and frame presses, second carbonation tanks and sulfur tower.

the beets; an increase from 17 to 18 percent sugar in beets will reduce fuel requirements more than 6 million calories per bag of sugar produced.

In addition, the plant is air-cooled at the rate of 330,000 cubic feet of air a minute and ventilated for the workers' comfort.

Comparative Plant Characteristics

The beet sugar refineries which are surveyed in this report represent a cross section of the industry in the United States with respect to size, age, location, and methods. Because of the confidential nature of much of the data presented in this report, exact data on size, age, location, and certain operations have been withheld to avoid identifying individual plants.

Plant A is the smallest refinery in the sample with a slicing capacity under 2,000 tons per 24-hours and an employment of 173 production workers. Statistics on production, quality of beets, length of campaign and employment for all plants may be found in tables 5 and 6. The plant is one of many under the control of a parent company, as are all other plants in the survey. The parent company performs such functions as administration, sales, and purchasing in addition to research, standardization of chemical analysis, and production control. Research at the plant is directed towards reduction of lime usage, better waste disposal, less scaling, and byproduct development. Improvements have been made in methods of trash, mud, and rock handling to overcome problems created by mechanical harvesting. Limitations of the process equipment in handling mud or adobe, however, is one factor controlling the slicing capacity of the refinery. Higher man-hours per ton than other plants are also shown for the diffusion operation as a result of the older, batch-type process. (fig. 9) The weight of the cossettes entering diffusion is calculated from the weight of juice and percent of sugar in juice, pulp, and cossettes, using a raw juice scale developed by the company. Pulp press water is not used in diffusion, nor is an antifoaming agent. Both activated carbon and filter aid are added before thick-juice filtration. The plant has 11 centrifugals which are loaded and discharged manually by four men while all parts of the cycle are automatically controlled. All sugar is packed, and the packing department operates continuously during the campaign. Packaged sugar is conveyed by inclined belt elevators to the stacking level in the warehouse, which is air conditioned to maintain 60 percent maximum humidity.

Plant B is of medium size with a slicing capacity of about 3,000 tons per 24 hours. It is the newest plant in the sample and as such has more equipment of later design than the other refineries. Equipment features in this plant, more fully described in a following section, include Silver chain-type continuous diffuser (fig. 10), automatic pH and evaporator controls, automatic carbonation end-point control, and automatic (except discharge) centrifugals. Research at the plant includes methods of disposal of pulp press water, which is being used in diffusion, and laboratory-scale study of the ion exchange process, described in a following section. Beets are stored at this plant, as at most of the other plants, in piles over metal ducts with openings through which blowers force air for ventilation of the pile. No antifoaming agent is necessary because of high purity beets. First carbonation juice is filtered on rotary vacuum filters, which require about 1/2 hour for cleaning every 8 hours. Only three of the four filters are used at one time. The cloths of the plate and frame presses at second carbonation require about 2 hours for cleaning every 24 hours. As in most plants, waste water goes to a pond and is later discharged into rivers. Waste lime cake is also pumped to a small pond.

Plant C also has a daily slicing capacity of about 3,000 tons per 24 hours. Beets are generally received by truck, stored in unventilated sheds, and carried to the factory by open flumes. Eighty-five percent of the flume water is recirculated, whereas between 50 to 60 percent is recirculated at Plants A, E, and F. Plants B and D reported none. Handling man-hours were high in 1951 because many beets were received by rail and required piling.

Seventy percent of the sugar content of the molasses from regular refinery operations is recovered at this plant by the Steffens process, described in a following section. The waste from this process is concentrated and sold for the recovery of monosodium glutamate. Almost half the sugar produced during the campaign is stored in bulk for packaging between campaigns. This enables the packing, warehousing, and shipping operations to be performed on only one shift, and eliminates the need for precise estimates of amounts and types of packages to fulfill consumer requirements. The company indicates that for this plant the labor cost (wages paid

Table 4. Indirect man-hour requirements by operation or labor account in 6 selected beet sugar refineries, U.S.A., 1951

Operation or labor account	Plant					
	A	B	C	D	E	F
	Per ton of beets					
Total indirect labor . .	0.349	0.267	0.285	0.298	0.224	0.380
Plant supervision . .	.076	.034	.039	.048	.040	.035
Boilerhouse	.040	.032	.010	.055	.016	.015
Laboratory	.066	.053	.074	.055	.045	.052
Maintenance	.081	.069	.078	.074	.048	.185
General 1/	.086	.079	.084	.066	.075	.093
	Per hundred pounds of sugar produced					
Total indirect labor . .	0.1288	0.1036	0.1013	0.1171	0.0835	0.1429
Plant supervision . .	.0280	.0133	.0140	.0188	.0149	.0133
Boilerhouse	.0149	.0123	(2/)	.0217	.0060	(2/)
Laboratory	.0243	.0205	.0263	.0217	.0169	.0197
Maintenance	.0299	.0267	.0312	.0289	.0179	.0750
General 1/	.0317	.0308	.0298	.0260	.0278	.0349

1/ General includes watermen, watchmen, sweepers, janitors, and supply handlers.

2/ Information not available.

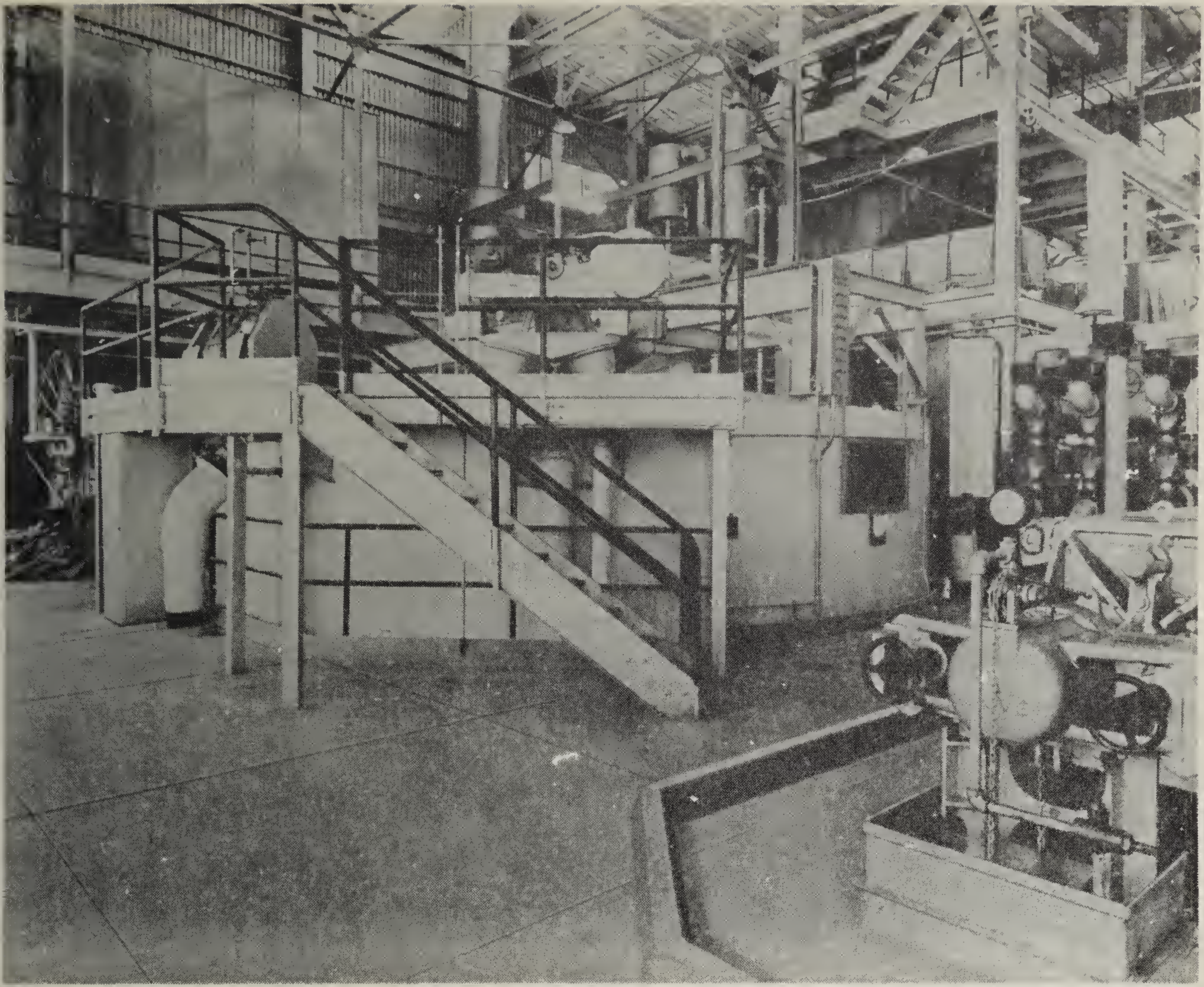

Fig. 11 Dorr multifeed carbonation thickener.

production and related workers, excluding administrative, sales, and office personnel) comprises 25 percent of total manufacturing cost, and materials comprise 24 percent.

Plant D was erected in the middle 1920's, has a slicing capacity of more than 2,000 tons per 24 hours, and has adopted many of the automatic controls more recently developed. However, it is concluded that the cost of major equipment replacements has prevented this refinery (and others erected before 1940) from installing certain improved methods such as continuous diffusion. As at most of the other refineries, however, the beet piles are ventilated and the warehouse is air conditioned. No utility men were reported for this plant. At other plants such employees work at different operations to relieve regular operators for short rest periods.

Plant E has a slicing capacity of more than 3,000 tons per 24 hours. It has continuous diffusion, many automatic controls, and facilities for mechanized handling and shipping of bulk dry pulp and bulk white sugar. A detailed description of the operations of this plant, whose operations required the least number of man-hours per ton of the surveyed plants, is given in the introduction to this chapter of the report.

Plant F is the largest refinery in the sample. Although the plant has up-to-date continuous diffusion system and also continuous carbonation, much of its equipment is more than 40 years old.

Table 5. Production and related statistics, 6 selected beet sugar refineries, U. S. A., 1951

Plant operating data	Plant					
	A	B	C	D	E	F
Length of campaign days	61	107	107	112	76	107
Tons of beets sliced .	96,164	323,298	240,929	243,095	228,781	510,682
Sugar in beets, percent .	16.41	15.92	14.58	15.65	16.51	14.56
Sugar losses percent . .	2.89	3.03	0.56	2.92	3.10	0.93
Battery	.23	.20	.26	.39	.24	.31
Lime cake	.02	.04	.05	.04	.02	.03
Molasses	2.60	2.37	.00	2.20	2.86	.00
Steffen filtrate . .	.00	.00	.16	.00	.00	.08
Unaccounted	.04	.42	.09	.29	.03	.51
Tons of sugar produced .	13,005	41,720	33,803	30,994	30,697	67,957
Powdered	199	550	none	134	52	1,420
Tablet	none	none	none	none	none	none
Liquid	none	none	5,500	none	none	19,594
Tons of pulp produced:						
Wet	26,445	none	82,000	none	none	none
Dried	none	19,443	none	12,513	15,990	33,746
Tons of molasses:						
Not processed	4,370	14,275	none	9,985	12,517	none
After processing . .	none	none	1,841	none	none	7,910
Tons of sugar packed:						
100-pound bag	11,959	27,379	12,420	15,986	9,119	38,931
25-pound bag	156	783	500	804	none	504
10-pound bag	1,196	8,604	1,599	6,582	609	4,880
5-pound bag	691	4,404	1,043	3,938	952	2,328
Other	none	none	18,231	none	19,970	21,434

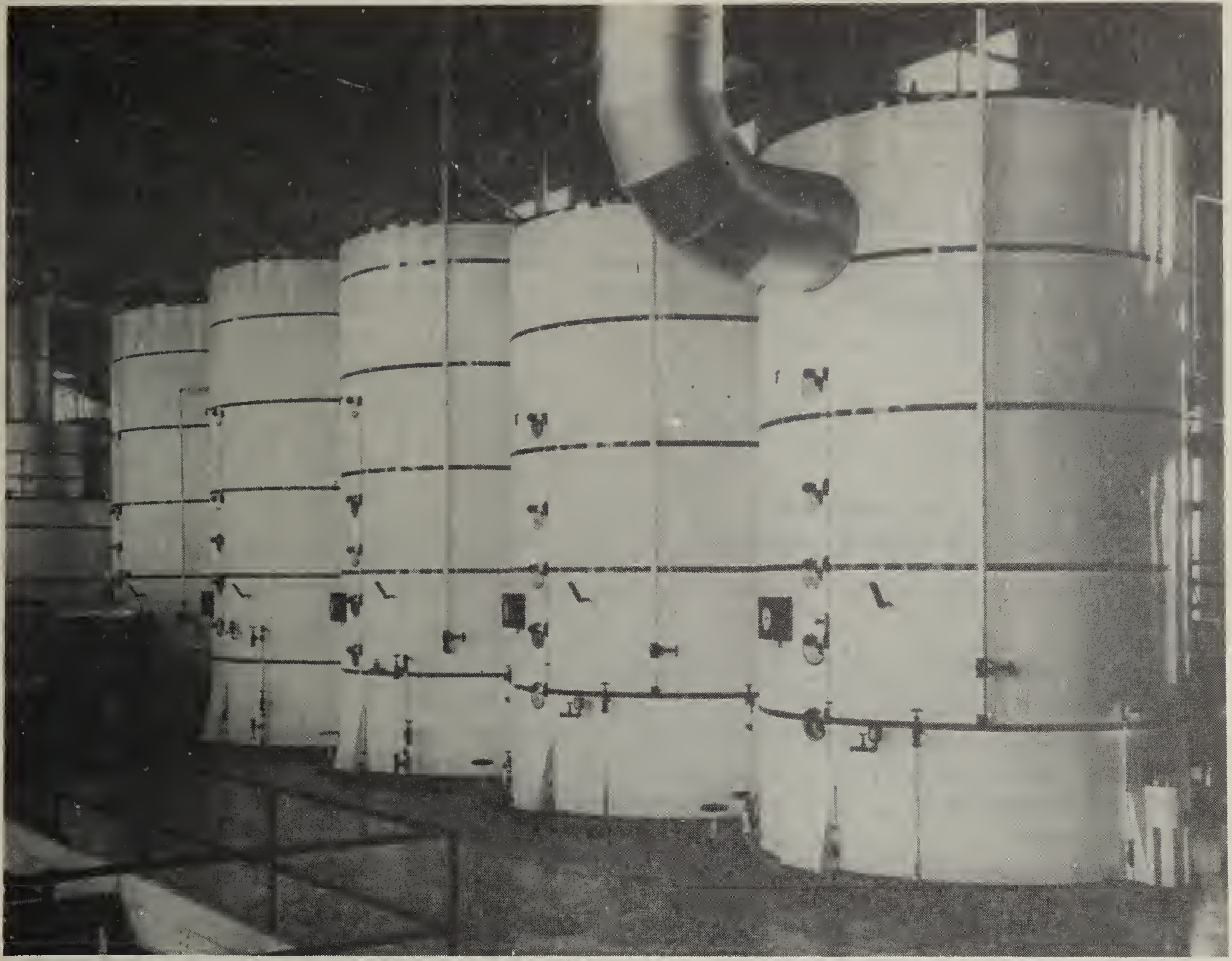

Fig. 12 Quintuple effect, calandria-type evaporator.

This older equipment, particularly filters and presses, accounts for much of the higher man-hour requirements of this plant. The man-hours devoted to cleaning of filter cloths per 24 hours have been enumerated as follows: 6 man-hours for 4 vacuum filters, 10.5 man-hours for 1 large Kelly press, 18 man-hours for 2 Sweetland presses, 78 man-hours for 6 plate and frame presses at first carbonation, 81 man-hours for 6 plate and frame presses at second carbonation, and 81 man-hours for 6 plate and frame presses for thin and thick juice carbonation. Lime cake, which is a waste product at other plants, is processed at this plant for the recovery of lime. During the 1951 campaign almost 5,000 tons of lime were recovered, reducing requirements of coke by almost 600 tons. The pulp from diffusion is pressed and dried at this plant. The water from pressing, which is also a waste product at all other plants except Plant B, is clarified and used in the Steffens operation to dilute molasses. Approximately 2.1

Table 6. Number of employees by type and occupation, 6 selected beet sugar refineries, U. S. A.

Employees by occupation	Plant					
	A	B	C	D	E	F
Total plant employment	173	360	221	252	228	765
Production and related workers	173	333	198	242	228	701
Direct workers	105	246	127	168	144	494
Indirect workers	68	87	71	74	84	207
Nonproduction workers	(1/)	27	23	10	(1/)	64
Production and related workers on first shift (8 a.m.-4 p.m.) . . .	64	99	(2/)	85	89	(2/)
Beet end:						
Unloaders	2	4	13	3	(3/)4	30
Flumers	4	1	) 8	2	3	)17
Trash catchers	2	3	)	2	1	)
Beet washers	2	1	)	2	1	)
Knife men	2	3	)	3	3	)
Picking table	1	2	)	1	2	)
Diffusion battery	4	1	3	5	1	24
Carbonators	1	1	) 7	2	1	)28
Filter pressmen	2	8	)	6	6	)
Laundry men	1	1	)	1	2	)
Evaporators	0	1	)	1	1	)
Utility men	1	3	2	0	1	7
Foremen	1	1	3	1	2	2
Sugar end:						
Sugar boilers and melter	2	4	) 7	2	3	)39
Centrifugal men	3	7	)	5	6	)
Granulators and crystallizers . .	1	1	3	2	2	9
Sugar packers (5 and 10 lb.) . . .	5	7	) 7	6	8	)21
Sugar packers (100 lb.)	2	3	)	3	4	)
Other (pilers, screens, etc.) . .	1	5	)	3	2	
Utility men	0	2		1		
Foremen	1	2	4	2	3	2
Lime kiln	2	3	4	5	3	13
Boilerhouse	4	4	(4/)	5	2	(4/)
Laboratory:						
Chemists	4	6	(4/)	6	5	(4/)
Samplers	1	2	(4/)	1	2	(4/)
Maintenance:						
Oilers	1	1	(4/)	1	1	(4/)
Electricians	1	1		1	2	
Machinists and mechanics	4	6		3	3	
Welders	1	1		1	1	
Other	1	2		2	1	

See footnotes at end of table.

Table 6. Number of employees by type and occupation, 6 selected beet sugar refineries, U.S.A.--Continued

Employees by occupation	Plant					
	A	B	C	D	E	F
General:			(4/)			(4/)
Watermen	2	1		0	1	
Janitors and sweepers	2	4		1	6	
Watchmen	(5/)	(5/)		1	1	
Truck operators	2	3		2	1	
Supply handlers	0	1		1	1	
Other	1	3		2	3	

1/ Located in central office.
2/ Number of employees not available by shift for laboratory, boilerhouse, and overhead accounts.
3/ Includes switch man and locomotive engineer.
4/ Information not available.
5/ Watchmen on 2d and 3d shifts only.

additional tons of sugar is recovered from every 1,000 tons of pressed pulp water sent to the Steffens process.

Equipment

Complete information on machinery and equipment was not available from all plants in the sample. However, similar equipment was employed by all plants with few exceptions such as diffusion and filtering. Much of the machinery of Plant E has been referred to in the introduction to this part of the report. Equipment in the following list is used in Plant B; differences in equipment of other plants, where known, are noted. Enclosed figures ( ) indicate number of units.

Stearns-Rogers variable speed beet feeder.

Franklin rock catcher (2) with automatic dumping.

Dalton trash catcher, 15 feet long.

Link-belt beet elevator, gravity discharge, 120 tons/hour capacity.

Beet hopper, 40 ton capacity, feeding slicers (Plant A - Ogden slicers (2) with Disston automatic filer and router).

Conveyor with Merrick Weightometer scale to diffusion, 259 feet/minute speed, 5,000 pounds/minute capacity (Plant D - Chronos scale).

Silver 21 cell continuous diffuser, heated by 2d and 3d vapor (Plants A and D - Roberts batch-type diffuser, 14 cell, 288 cubic feet per cell).

Table 7. Square feet of evaporator heating surface, 3 selected beet sugar refineries, U. S. A., 1951

Evaporator	Plant		
	A	B	D
First effect .	7,360	10,000	5,462
Second effect .	7,360	9,000	5,462
Third effect .	3,669	9,000	5,462
Fourth effect .	3,669	7,000	5,462
Fifth effect .	3,669	3,000	5,462

Table 8. Fuel to boilers in thousands of calories, 6 selected beet sugar refineries, U. S. A., 1951

Plant	Fuel (thousands of calories)	
	Per ton of beets sliced	Per hundredweight of sugar produced
A . .	634.5	141.1
B . .	488.4	189.2
C . .	519.9	185.2
D . .	564.5	221.5
E . .	378.5	141.1
F . .	680.6	255.8

Ogden horizontal raw juice heaters (4) 1,000 sq. ft. heating surface each (Plant A-(4) 730 sq. ft. heating surface).

Dorr continuous first carbonation, 3 tanks, Howard milk of lime feeder, Byron-Jackson circulator, Dorr thickener (Plant D changed to a modified continuous system using old tanks; Borden thickeners).

Thickening sludge tank with Netto turbine agitator.

Emico first carbonation filters (4) Plants A, C, and D - Oliver rotary-vacuum filters (3), 8 feet by 12 feet; Plant F - 4 vacuum filters, 1 Kelly, 2 Sweetland, 6 plate and frame presses.

Second carbonation, two tanks.

Silver second carbonation plate and frame presses (3), 46.9 cu.ft. each, 1,000 sq.ft. filtering area each (Plant A-11 plate and frame presses; Plant C - 2 Kelly presses; Plant D - 3 Shriner plate and frame presses, 800 sq. ft. filtering area each; Plant F - 6 plate and frame presses).

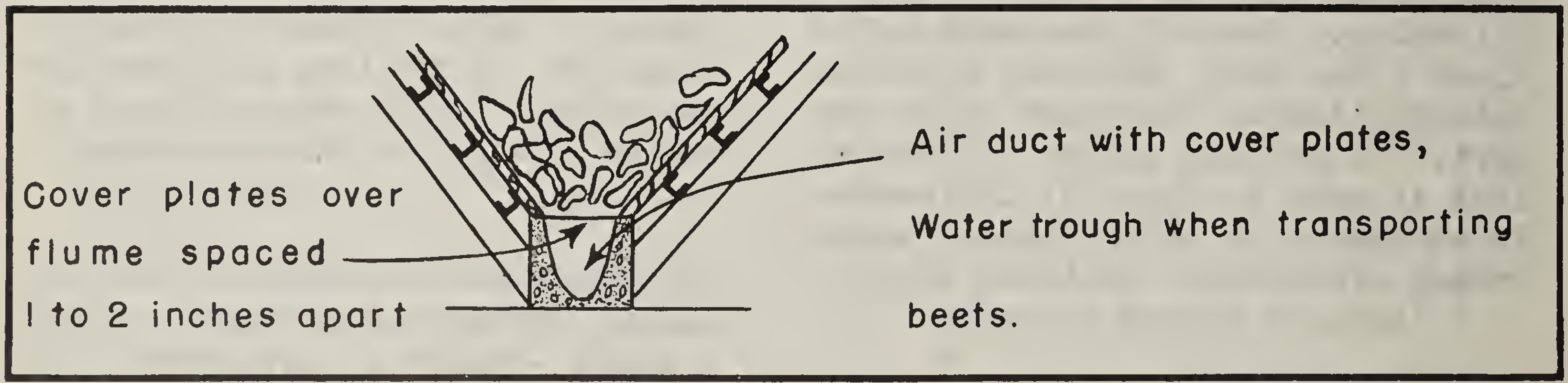

Fig. 13 Diagram of typical flume installation in receiving bin.

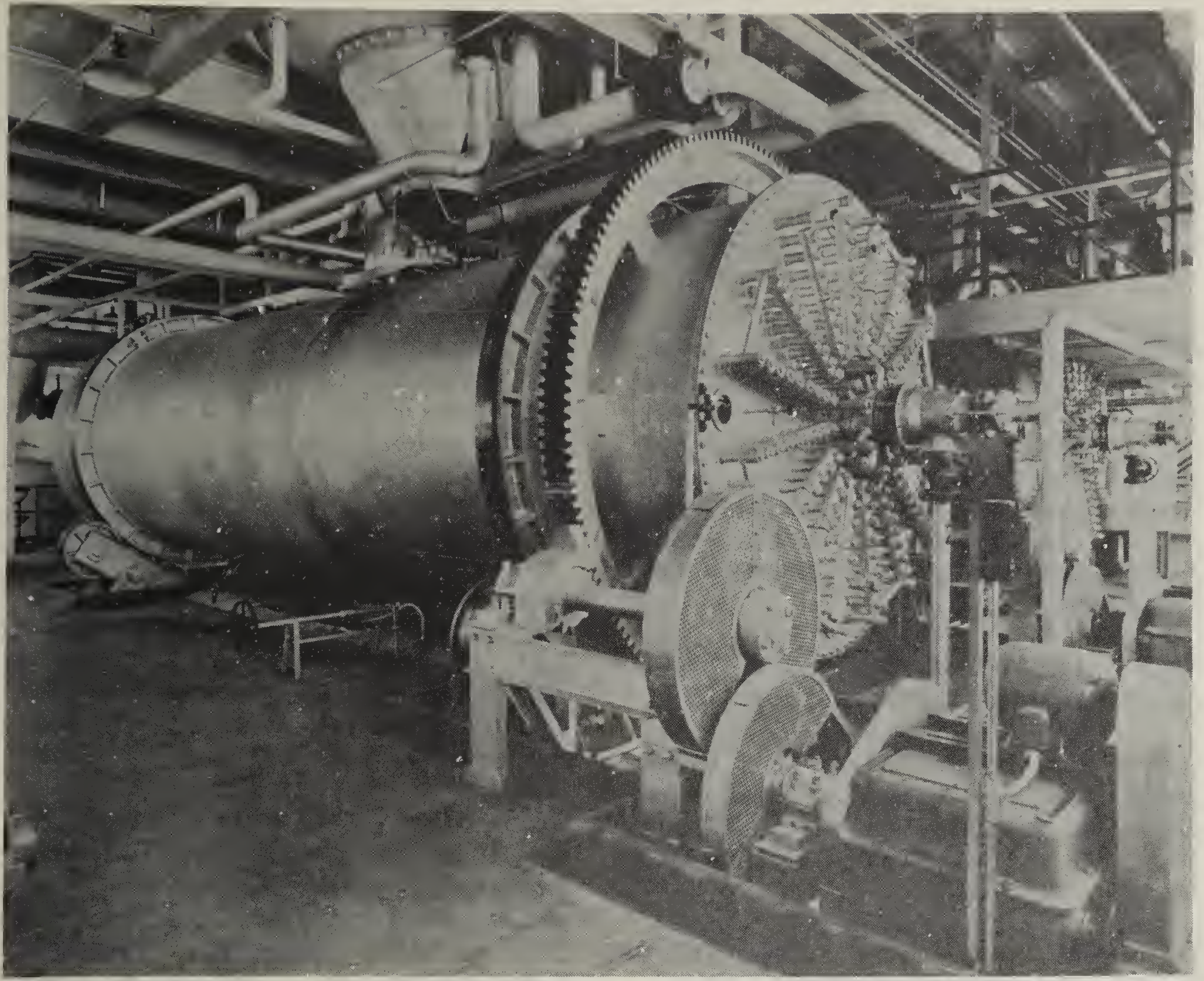

Fig. 14 La Feuille rotary crystallizer.

Glen Falls sulfur burner, rotary type, 20 inch diameter by 5 ft. long, 35 to 100 pounds/hour; sulfur tower, 6 ft. diameter by 19 ft. high, equipped with wooden baffles. (Plant A - freeport sulfur burner).

Silver thin juice plate and frame presses (3), 46.9 cu.ft. each 1,000 sq. ft. filtering area each (Plant C - 8 plate and frame presses for thick and thin juice; Plant D - 3 Kroog plate and frame presses, 750 sq. ft. filtering area each; Plant F - 6 plate and frame presses for thick and thin juice).

Thin juice boiler, horizontal, 1,000 sq.ft. heating surface.

Ogden thin juice heater (2), horizontal, 1,000 sq.ft. heating surface (Plant A - 1, open, 1,512 sq. ft. and 1, vertical, 730 sq.ft. heating surface).

Stearns-Rogers 5-effect evaporators - see data accompanying fig. 12.

Ogden thick juice heater (2), 6,000 sq.ft. heating surface (Plant D 1,500 sq.ft. heating surface).

High melter tank, 10 ft. diameter by 6 ft. high.

Thick juice presses (3) and re-filters (3) - same as for second carbonation for this plant.

Stearns-Rogers white sugar vacuum pans (2), 13 ft. diameter by 6 ft. 9 inches high, 16 coils, 1,200 sq. ft. heating surface (Plant A - 2, 12 ft. coil, 1,300 cu.ft. capacity, 1,000 sq.ft. heating surface; Plant D - 3 coiled, 1 calandria).

White sugar mixer (1), 1,975 cu.ft. capacity, with Stevens mingler (Plant D - 3 mixers without minglers).

White sugar centrifugals (Plant A - 3 Western States centrifugals, 1,500 r.p.m., 40 inch diameter by 24 inches high; Plant D - 5 Western States centrifugals).

Wet sugar elevator, Promal chain type, 14 by 7 ft., style C buckets.

LaFeville crystallizer (2), 1,500 cu.ft. each, .1 to .5 r.p.m. (fig. 13) (Plant A - LaFeville (2), 200 cu. ft. capacity; Plant D - (8), 1,040 cu.ft. capacity each, type not known).

Granulator, Link-Belt Rotolouvre, 1.9 to 7.6 r.p.m., equipped with heaters having capacity for 7,300 c.f.m. when raising air temp. from 30°F to 245°F (Plant A - (1) Hersey, 6 ft. by 22 ft.; Plant D - (2) Hersey, 6 ft. by 23 ft.).

Granulator air filter, Westinghouse Precipitron (1); Screens (4) Hummel (Tyler Co.), 3 ft. by 10 ft. two surface, 50,000 pounds/hour capacity (Plant A - (1) Rotex No. 52).

Stearns-Rogers high raw vacuum pans (2), 1,300 cu. ft. each, 2,610 sq. ft. heating surface (Plant A - (1) calandria type, 1,400 cu.ft., 2,423 sq. ft. heating surface).

High raw sugar mixer, 1,440 cu. ft. capacity, equipped with Stevens mingler.

High raw sugar centrifugals (3), Western States, 1,600 r.p.m., fluid drive (Plant A-(4), Western States, 1,500 r.p.m., Plant D-(3), type not known).

Stearns-Rogers low raw vacuum pans (2), 1,600 cu.ft. each, 2,610 sq.ft. heating surface (Plant A - (1) calandria type, 1,400 cu. ft. 2,876 sq. ft. heating surface).

Low raw sugar mixer, 1,789 cu.ft. capacity, equipped with Stevens mingler.

Low raw sugar centrifugals (8), Western States, 1,800 r.p.m., fluid drive, automatic operation (Plant A - (4) Western States, 1,600 r.p.m., Plant D - (6), automatic wash, type not known).

Vacuum pumps (8), Chicago Pneumatic, horizontal, various sizes.

Elliott carbon dioxide blower No. 36-x, type O.

Limerock kiln (1), vertical, 4,500 cu.ft. capacity, 15 ft. diameter by 52 ft. 4 inches high.

Mikro sugar pulverizer, 30 one-hundred pound bags per hour (Plants A and D - Schultz - O'Neill pulverizer).

Merrifield 100-pound packer for fabric bags, with scale and bag sewing conveyor (1); St. Regis valve packer, type 152, for paper bags, 361 one-hundred pound bags per hour.

Merrifield type 62 with Union Special bag-closing head, for 5-and 10-pound bags, automatic baler for six 10-pound bags, Sisley baler for 5-pound bags.

Conveyor for 100-pound bags, 15 to 35 ft/minute, to overhead warehouse conveyor, 312 ft. long.

Stearns-Rogers pulp presses (11), Bromberger type, 250-300 tons per 24 hours.

Laclede-Christy pulp drying furnace (2), approximately 2,950 cu.ft. combustion space each.

Pulp drying drums (2), 10 ft. 6 in. diameter by 48 ft. long, blower belt driven from 100 hp. motor.

B&W Boilers (2), 410 p.s.i. working pressure, 90,000 pounds steam/hour each, 16,950 sq. ft. each heating surface (Plant A - Combustion Engineering Co. boilers (3) 7,100 pounds steam/hour each).

Detroit Roto-Grate boiler stokers with continuous ash discharge, 235.5 sq.ft. area each.

General Electric turbo-generator, 400 p.s.i., 27.22 pounds per kw.-hr.

Equipment Installation

The addition or displacement of labor as a result of equipment installations between 1922 and 1935 is shown in table 9. Of the 155 units installed, 60 displaced labor, 30 added labor, and 65 caused no change in employment. An analysis of the data revealed that of the 164 men who were displaced, 49 were unskilled and 115 were skilled or semi-skilled machine operators. Fifty of the 60 units which displaced labor affected skilled employees whereas the remaining 10 units affected unskilled or hand labor. Capital investment for equipment, therefore, tends to re-

Table 9. Changes in employment of labor accompanying the installation of machinery in 26 beet sugar refineries, U.S.A., 1922-35 1/

Year	Machines installed			Factory labor (number of men per shift) 3/	
	Number of units	Value	Embodied labor 2/ (man-hours)	Displaced	Added
Total	155	$634,567	591,423	164	34
1922	4	3,600	3,672	0	0
1923	6	2,700	2,511	4	0
1924	0	-	-	-	-
1925	2	15,300	13,464	0	0
1926	0	-	-	-	-
1927	0	-	-	-	-
1928	14	65,481	56,968	0	15
1929	14	90,985	74,608	22	0
1930	15	97,602	80,034	75	0
1931	1	8,140	7,570	13	0
1932	15	19,167	23,000	1	0
1933	0	-	-	-	-
1934	31	198,805	200,793	41	19
1935	53	132,787	128,803	8	0

1/ Data not comparable from year to year, because only installations for which the employment effects were reported are included.

2/ Value multiplied by man-hours per dollar of value derived by the National Bureau of Economic Research.

3/ Based on net effect of each installation.

Source: Works Progress Administration National Research Project N-1, Productivity and Employment in Selected Industries - Beet Sugar, Philadelphia, Pa., October 1938.

sult in a greater displacement of skilled workers in this industry.

Because the change in employment in table 9 is given per shift, almost three times as many men were displaced or added as is stated. Moreover, the additions of labor may not have been accompanied by an increase in total campaign man-hours of employment in the refineries. Where the installation of machinery was made to increase daily slicing capacity, and where there was not a corresponding increase in production, the increases in the number of employees would in effect result in reduction in total man-hours utilized.

Similar information concerning the installation of equipment in more recent years was not available. Such installations, however, have emphasized more automatic operations. This is evidenced by continuous diffusion systems with automatic cossette scales and controls; numerous automatic level, temperature, and pH controls; and almost completely automatic centrifugals. Batteries of six centrifugals can now be operated by only two men. Other additions have provided facilities for handling bulk dry pulp and for the handling and distribution of bulk granulated and liquid sugar. Better packing methods feature the valve-type bag which requires no gluing or sewing. Research efforts are producing results in reducing the use of lime and filter aids, reducing foaming and scaling, and improving waste disposal and byproduct recovery. Increased sugar extraction has been obtained by the return to process of pulp press water and molasses, and from the ion exchange process. This process and the Steffens process are discussed in the following sections.

Ion Exchange Process

The ion exchange process of juice purification has been tried or proposed for treating diffusion juice, second carbonation juice, green sirups, molasses, and Steffen filtrate. At present three beet sugar refineries are equipped to use this process on second carbonation juice. In the process the juice flows through beds of resins or exchangers which remove practically all of the salts and many of the organic impurities from the juice before it is boiled. The advantages claimed for this process over conventional methods include increased yields of granulated sugar, with reported extractions up to 93 percent; higher purity; better color removal; lower ash content; crystallization of two or three "strikes" of white sugar instead of one; elimination of evaporator and pan boil-outs; fewer processing problems; production of edible molasses; and greater potentiality for byproducts.

Disadvantages which have limited the wider adoption of the process are the high initial cost of new equipment, the high costs of the resins and regenerating chemicals, and costs of transportation for the materials. The equipment of the surveyed plant includes four pair of tanks with heads designed for a working pressure of 60 p.s.i. The tanks, pipes, and valves are rubber-lined for protection against acid. The process is controled by the push-button operation of switches which open or close the valves. Table 10 indicates the increased extraction of sugar using

Table 10. Comparison of conventional and ion exchange operations (per 24-hour day) in beet sugar refining, by selected factors, U. S. A., 1951

Factor	Type of operation	
	Conventional	Ion exchange
Daily slice		
Cossette sugar, tons	1600	1600
Sugar entering battery, tons	16	16
Beet end losses, tons	256	256
Percent of beets		
Pulp 0.13		
Water 0.10		
Lime Flume 0.02		
Unknown 0.15		
Total 0.40	6.4	6.4
Net sugar in thin juice, tons	249.6	249.6
Ion exchange loss including sweetening off and inversion, tons	...	6.0
Sugar to sugar end, tons	249.6	243.6
Purity thick juice	90	96.5
Purity of molasses	60	60
Sugar-end extraction, percent	83.3	94.5
Sugar bagged, ton	207.9	230.2
Sugar in molasses, tons	41.7	13.4
Molasses at 50 polarization, tons	83.4	26.8
Extraction, percent on sugar in beets	81.2	89.9
Costs		
Labor, 2 men per shift	$ ...	$ 60
Regenerants per ton beets		
Acid, 20 lb. at 0.015 lb.	...	480
Ammonia, 6 lb. at 0.05 lb.	...	480
Fuel, 1 percent additional	...	10
Sugar bags, 446 bags at 0.16	...	71
Total costs		$1101
Credits		
Extra sugar, 446 bags at $6.50	...	2900
Decreased molasses, 56.6 tons at $20 ton	1132	
Credits minus costs		667
Return per ton beets		0.41

Source: Maudru, J. E. (Holly Sugar Corp.) "Ion Exchange in Beet Sugar Manufacture", Industrial and Engineering Chemistry, 43:615, permission of American Chemical Society, copyright owner.

the ion-exchange method and the dollar return from the extra sugar. Costs which are the same for either method used were excluded from the cost balance.

Steffen Process [4]

Although European beet sugar refineries do not try to recover additional sugar from beet molasses because of its value as a source of alcohol, yeast, and stock feed, this practice, called the Steffen process, is fairly common in the United States. It consists of adding powdered dry lime (CaO) to the cold (about 12°C) and diluted (about 6 percent sucrose) molasses sirup under agitation. The lime combines with the sugar to form tricalcium saccharate which precipitates and is filtered. The filtrate is heated and the precipitate removed by settling and filtration. The final filtrate serves as a raw material for the recovery of by-products. The two filter cakes are dispersed in about 10 percent refinery sweetwater, heated and added into the factory carbonation with the diffusion juice, replacing the milk of lime used in conventional refineries. The heated saccharate then decomposes to sugar and calcium hydroxide, which serves as the purifying agent for the diffusion juice. In plants where the Steffen process is used the total recovery of sugar from beets sliced is almost 90 percent.

In one refinery in the United States the Steffen discard-molasses is subjected to the barium saccharate process and rotary kilns are used for barium regeneration. The world's principle source of raffinose is crystalized directly from the final molasses in this plant.

The Steffen filtrate, although comprising only about 4 percent of total refinery waste volume, is responsible for almost half the biochemical oxygen demand, and as such creates a serious problem of disposal. Some refineries have installed equipment which carbonates and concentrates the filtrate, which is then sold to manufacturers of amino acid products.

Monosodium Glutamate [5]

Several plants recover monosodium glutamate, a flavor-accentuating agent, by alkaline hydrolysis of the concentrated Steffen filtrate. After hydrolysis of the filtrate with a 50 percent solution of caustic soda, the liquid is partially acidified with hydrochloric acid and again concentrated. The mixture of hydrochloric and glutamic acids creates a difficult problem of metal corrosion which requires the use of stainless steel or rubber-lined equipment. The concentration results in the crystallization of inorganic salts which are removed by centrifugal action. The filtrate is further acidified and the solution crystallized, the latter requiring from 5 to 8 days; the crystals are separated by high-speed centrifugals. The filtrate may be processed to obtain betaine. The crude glutamic acid is then purified, concentrated, crystallized and centrifuged, producing pure (almost 100 percent) monosodium glutamate.

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[4] Information on the Steffens process and monosodium glutamate, as well as much valuable background and processing data, was obtained from McGinnis, R. A., Beet Sugar Technology, Reinhold Publishing Corp., pp. 135, 477, 481, New York, 1951.

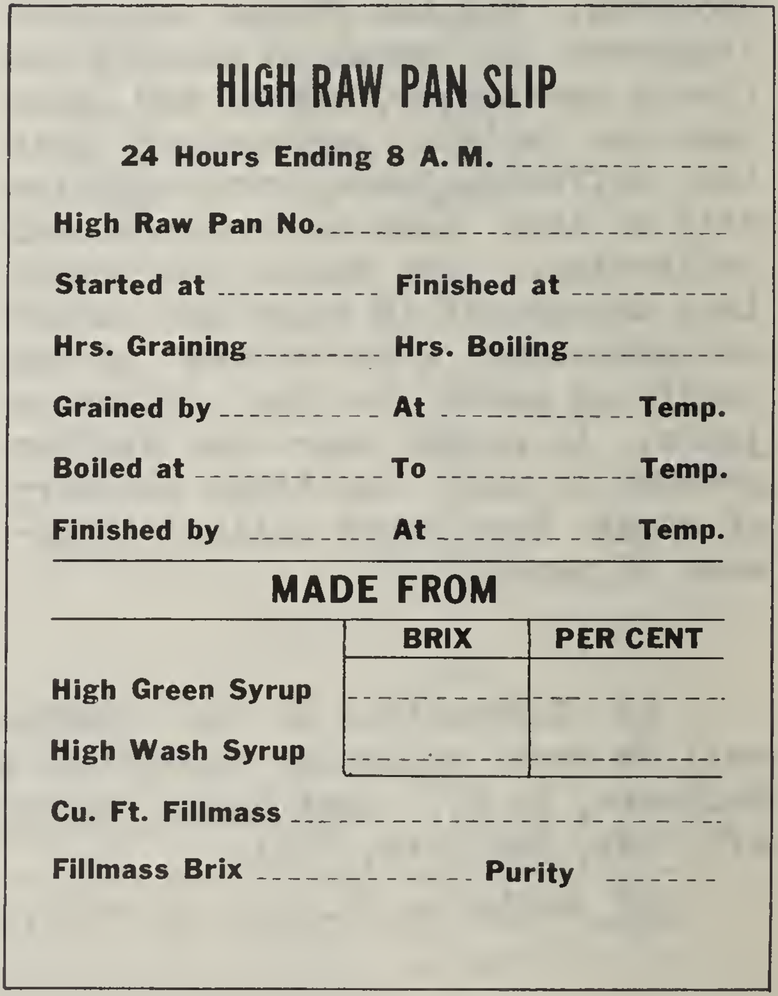
[5] McGinnis, R. A., op. cit., pp. 135, 477, and 481.

Production Control

The control of production of granulated and liquid sugar, pulp, molasses, process materials, and byproducts is of particular importance in the industry, not only to supply a cumulative accounting record of output but also to furnish comparative data for analysis of costs and efficiency. The examination of such data from all plants is one means of effective control by the parent company over the operations of its many plants. The continuous operations of the refinery, with three 8-hour shifts daily, throughout the short campaign period, require numerous hourly checks on all phases of operations. It is essential that the process continue without interruption and with as high an extraction of sugar as possible, because beets are received continuously from the fields and prolonged storage reduces their sugar content. The smallest number of man-hours expended per ton of beets is always associated with the fastest slicing rate, because the workers, in most cases, perform the same functions for any slicing rate. The data which indicate the performance of the various operations are recorded by the foremen, chemists samplers, or operators on forms such as the following (the specific information recorded on the forms listed in this section is available on request):

- Juice report
- Pan bench report
- Pan slip (fig. 14)
- Crystallizer report
- Centrifugal report
- Boiler house report
- Fuel report (fig. 15)
- Knives and files report
- Pulp dryer report
- Sugar end foreman's report
- Beet end foreman's report
- Superintendent's daily and weekly report (fig. 16)

These reports show both operating characteristics of the equipment and chemical or analytical results of tests on the material in process. In addition, a major control item is the listing of delays and their causes. These forms also assist in the control and accounting of sugar produced and packed.



HIGH RAW PAN SLIP

24 Hours Ending 8 A. M. ____________

High Raw Pan No. ____________

Started at ________ Finished at ________

Hrs. Graining ________ Hrs. Boiling ________

Grained by ________ At ________ Temp.

Boiled at ________ To ________ Temp.

Finished by ________ At ________ Temp.

MADE FROM

	BRIX	PER CENT
High Green Syrup		
High Wash Syrup		

Cu. Ft. Fillmass ____________

Fillmass Brix ________ Purity ______

Fig. 15 High raw vacuum pan slip.

FUEL REPORT

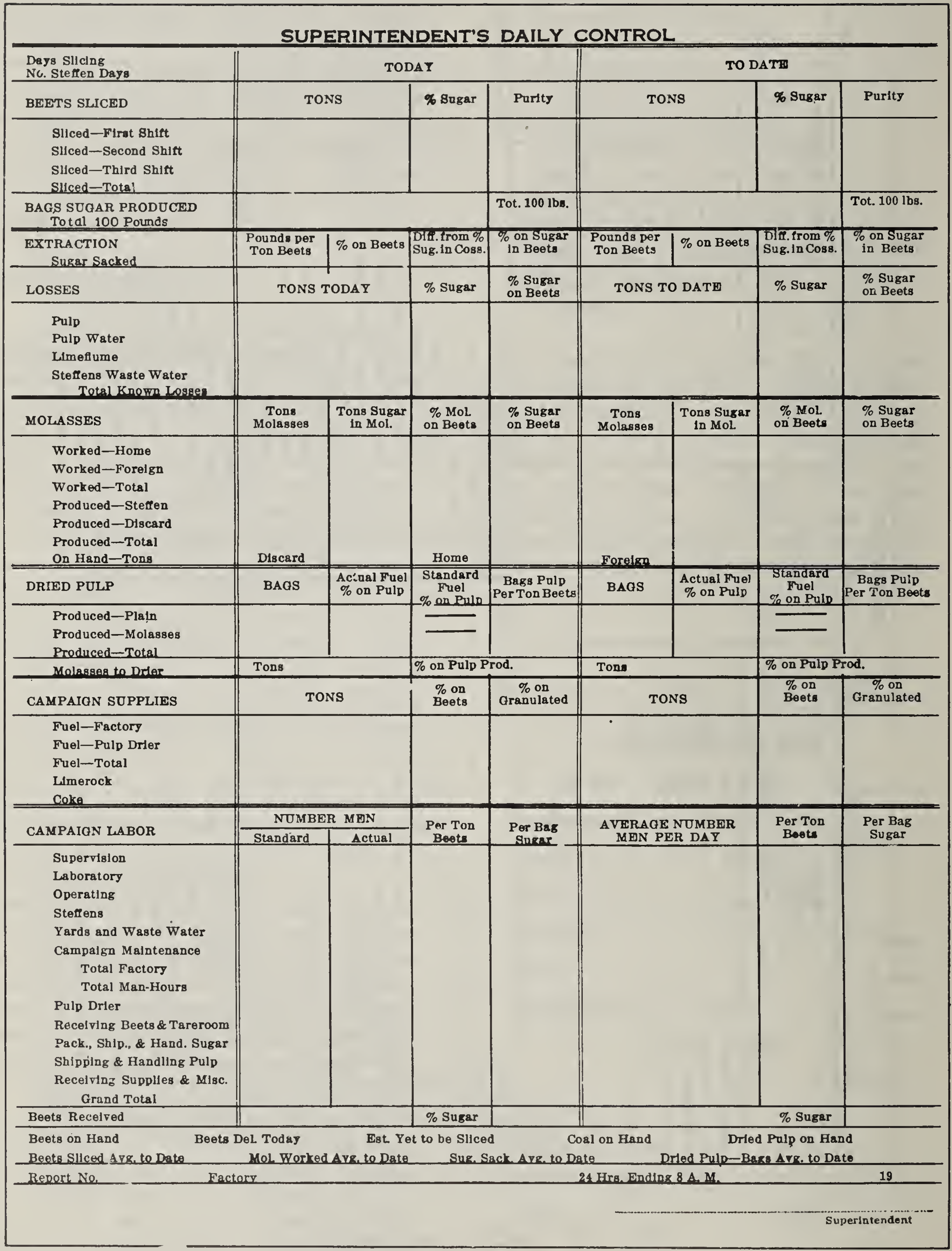
________FACTORY________DAY FROM________A.M. TO________A.M.________19____

Station	Cu. Feet Gas Burned (M) .		Tons Oil Burned		Tons Coal As Fired		Tons Fuel 10,000 B. T. U.		Standard Fuel (10,000 B. T. U.)			
									% On Beets		% On Sugar	
	Today	To-Date	Today	To-Date	Today	To-Date	Today	To-Date	Today	To-Date	Today	To-Date
Boiler House												
Pulp Plant												
Total												

FUEL DATA:	Today	To-Date
(1) Avg. B. T. U. per Cu. Ft. Gas		
(2) Avg. B. T. U. per Lb. Oil or Coal		
(3) Avg. B. T. U. per Lb. Coal as Fired—Boiler House		
(4) Avg. " " " " " Pulp Drier		
(5) Avg. Gas Press. at Burner (Lbs.)		
(6) Avg. Air Press. (In. Water)		
(7) Avg. Temp. Gas (°F)		
BOILER HOUSE OPERATIONS:		
(8) Avg. Boiler Pressure		
(9) Avg. Temp. Boiler Feed (°C)		
(10) Temp. Flue Gas (°F)		
(11) % CO_2 in Flue Gas		
(12) Factor of Evaporation		
(13) M Lbs. Water Evaporated (Meter)		
(14) M Lbs. Equiv. Water Evap.—From and at 212°F		
(15) Total Rated H. P. Boilers in Service		
(16) Boiler H. P. Developed		
(17) Avg. % Rating Boilers Operated		
(18) % Efficiency Boiler, Furnace & Grate		
(19) % Steam on Beets		
(20) % Steam on Granulated		
(21) Lbs. Water Evaporated per 10,000 B. T. U.		
(22) Steam Cost per 1,000 Pounds—$		

FACTORY OPERATING DATA:	Today	To-Date
(23) Tons Beets Sliced		
(24) Bags Sugar Produced		
(25) Cu. Ft. Gas Per Ton Beets		
(26) Cu. Ft. Gas Per Bag Sugar		
(27) Fuel Cost—Boiler House Total		
(28) Boiler House Fuel Cost per Ton Beets		
(29) Boiler House Fuel Cost per Bag Sugar		
(30) B.T.U. (M) per Bag Sugar		
PULP DRIER OPERATING DATA:		
(31) Temp. Gases Ent. Pulp Drier Drum (°C)		
(32) Temp. Gases Leav. Pulp Drier Drum (°C)		
(33) % Moisture Pressed Pulp		
(34) % Moisture Dried Pulp		
(35) Tons Molasses to Drier		
(36) Bags Plain Pulp Produced		
(37) Bags Molasses Pulp Produced		
(38) Total Bags Dried Pulp Produced		
(39) Bags Pulp Produced per Ton Beets		
(40) % Molasses on Pulp		
(41) Cu. Ft. Gas per Bag Pulp		
(42) Lbs. Standard Fuel per Bag Pulp		
(43) Fuel Cost—Pulp Drier Total		
(44) Pulp Drier Fuel Cost per Bag Pulp		

Fig. 16 Daily fuel report.



SUPERINTENDENT'S DAILY CONTROL

Days Slicing No. Steffen Days	TODAY				TO DATE			
BEETS SLICED	TONS		% Sugar	Purity	TONS		% Sugar	Purity
Sliced—First Shift								
Sliced—Second Shift								
Sliced—Third Shift								
Sliced—Total								
BAGS SUGAR PRODUCED Total 100 Pounds				Tot. 100 lbs.				Tot. 100 lbs.
EXTRACTION Sugar Sacked	Pounds per Ton Beets	% on Beets	Diff. from % Sug. in Coss.	% on Sugar in Beets	Pounds per Ton Beets	% on Beets	Diff. from % Sug. in Coss.	% on Sugar in Beets
LOSSES	TONS TODAY		% Sugar	% Sugar on Beets	TONS TO DATE		% Sugar	% Sugar on Beets
Pulp								
Pulp Water								
Limeflume								
Steffens Waste Water								
Total Known Losses								
MOLASSES	Tons Molasses	Tons Sugar in Mol.	% Mol. on Beets	% Sugar on Beets	Tons Molasses	Tons Sugar in Mol.	% Mol. on Beets	% Sugar on Beets
Worked—Home								
Worked—Foreign								
Worked—Total								
Produced—Steffen								
Produced—Discard								
Produced—Total								
On Hand—Tons	Discard		Home		Foreign			
DRIED PULP	BAGS	Actual Fuel % on Pulp	Standard Fuel % on Pulp	Bags Pulp Per Ton Beets	BAGS	Actual Fuel % on Pulp	Standard Fuel % on Pulp	Bags Pulp Per Ton Beets
Produced—Plain								
Produced—Molasses								
Produced—Total								
Molasses to Drier	Tons		% on Pulp Prod.		Tons		% on Pulp Prod.	
CAMPAIGN SUPPLIES	TONS		% on Beets	% on Granulated	TONS		% on Beets	% on Granulated
Fuel—Factory								
Fuel—Pulp Drier								
Fuel—Total								
Limerock								
Coke								
CAMPAIGN LABOR	NUMBER MEN		Per Ton Beets	Per Bag Sugar	AVERAGE NUMBER MEN PER DAY		Per Ton Beets	Per Bag Sugar
	Standard	Actual						
Supervision								
Laboratory								
Operating								
Steffens								
Yards and Waste Water								
Campaign Maintenance								
Total Factory								
Total Man-Hours								
Pulp Drier								
Receiving Beets & Tareroom								
Pack., Ship., & Hand. Sugar								
Shipping & Handling Pulp								
Receiving Supplies & Misc.								
Grand Total								
Beets Received			% Sugar				% Sugar	

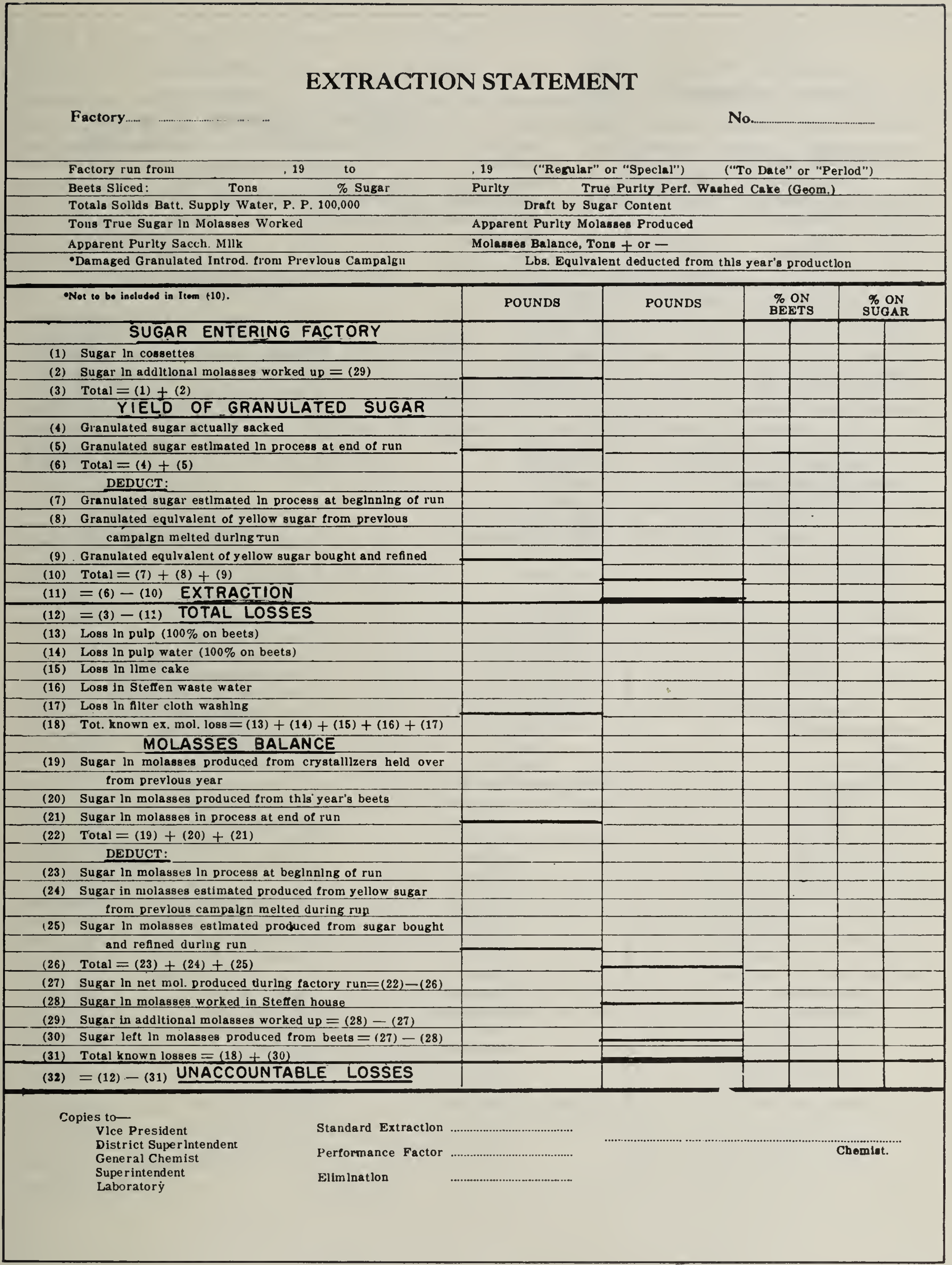
Beets on Hand Beets Del. Today Est. Yet to be Sliced Coal on Hand Dried Pulp on Hand

Beets Sliced Avg. to Date Mol. Worked Avg. to Date Sug. Sack. Avg. to Date Dried Pulp—Bags Avg. to Date

Report No. Factory 24 Hrs. Ending 8 A. M. 19

Superintendent

Fig. 17 Superintendent's daily report.



EXTRACTION STATEMENT

Factory...... No...

Factory run from , 19 to , 19 ("Regular" or "Special") ("To Date" or "Period")

Beets Sliced: Tons % Sugar Purity True Purity Perf. Washed Cake (Geom.)

Totals Solids Batt. Supply Water, P. P. 100,000 Draft by Sugar Content

Tons True Sugar in Molasses Worked Apparent Purity Molasses Produced

Apparent Purity Sacch. Milk Molasses Balance, Tons + or —

*Damaged Granulated Introd. from Previous Campaign Lbs. Equivalent deducted from this year's production

*Not to be included in Item (10).	POUNDS	POUNDS	% ON BEETS		% ON SUGAR	
SUGAR ENTERING FACTORY						
(1) Sugar in cossettes						
(2) Sugar in additional molasses worked up = (29)						
(3) Total = (1) + (2)						
YIELD OF GRANULATED SUGAR						
(4) Granulated sugar actually sacked						
(5) Granulated sugar estimated in process at end of run						
(6) Total = (4) + (5)						
DEDUCT:						
(7) Granulated sugar estimated in process at beginning of run						
(8) Granulated equivalent of yellow sugar from previous campaign melted during run						
(9) Granulated equivalent of yellow sugar bought and refined						
(10) Total = (7) + (8) + (9)						
(11) = (6) — (10) **EXTRACTION**						
(12) = (3) — (11) **TOTAL LOSSES**						
(13) Loss in pulp (100% on beets)						
(14) Loss in pulp water (100% on beets)						
(15) Loss in lime cake						
(16) Loss in Steffen waste water						
(17) Loss in filter cloth washing						
(18) Tot. known ex. mol. loss = (13) + (14) + (15) + (16) + (17)						
MOLASSES BALANCE						
(19) Sugar in molasses produced from crystallizers held over from previous year						
(20) Sugar in molasses produced from this year's beets						
(21) Sugar in molasses in process at end of run						
(22) Total = (19) + (20) + (21)						
DEDUCT:						
(23) Sugar in molasses in process at beginning of run						
(24) Sugar in molasses estimated produced from yellow sugar from previous campaign melted during run						
(25) Sugar in molasses estimated produced from sugar bought and refined during run						
(26) Total = (23) + (24) + (25)						
(27) Sugar in net mol. produced during factory run = (22) — (26)						
(28) Sugar in molasses worked in Steffen house						
(29) Sugar in additional molasses worked up = (28) — (27)						
(30) Sugar left in molasses produced from beets = (27) — (28)						
(31) Total known losses = (18) + (30)						
(32) = (12) — (31) **UNACCOUNTABLE LOSSES**						

Copies to—
Vice President
District Superintendent
General Chemist
Superintendent
Laboratory

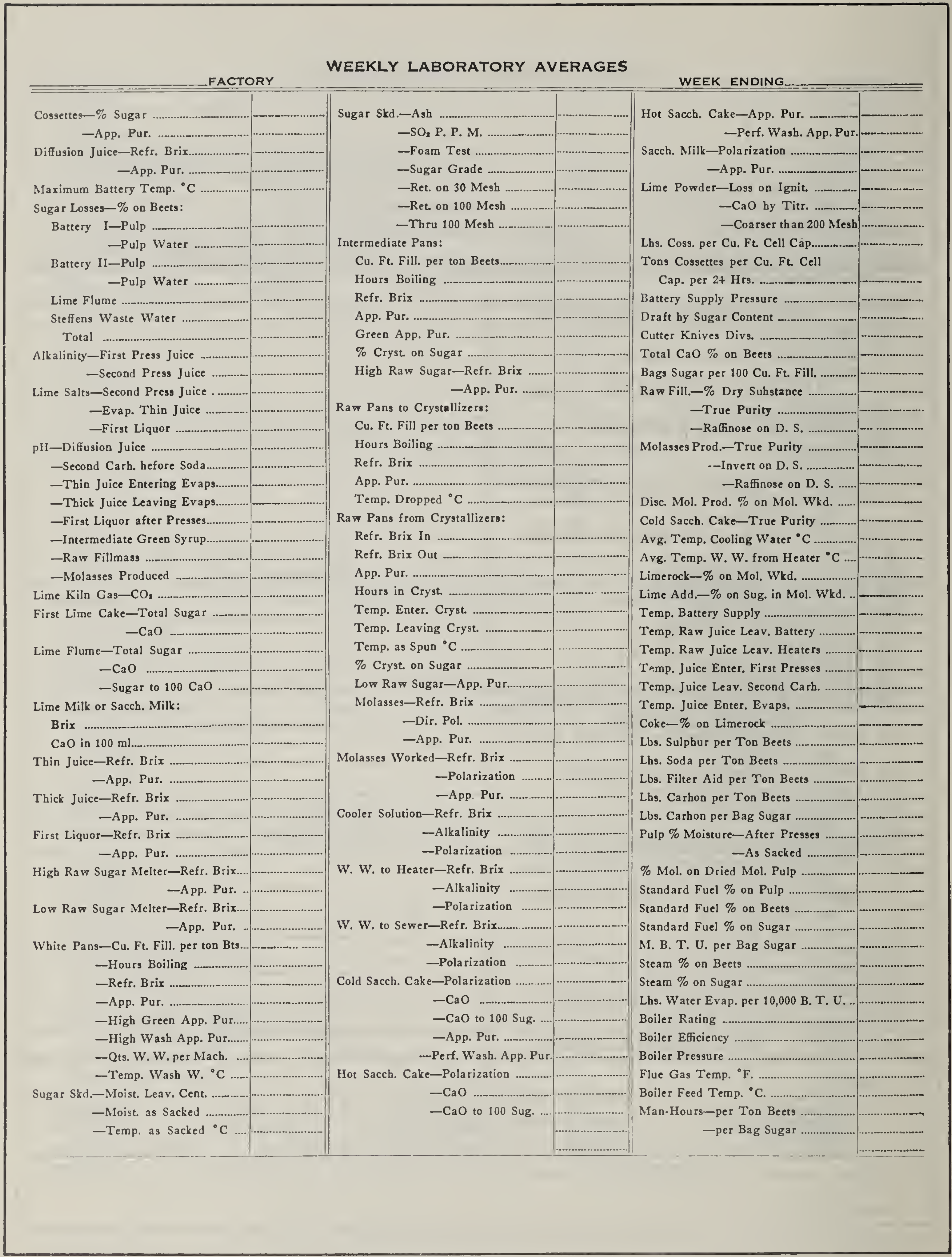
Standard Extraction ......

Performance Factor ......

Elimination ......

...... Chemist.

Fig. 18 Typical extraction statement of a beet sugar refinery, U. S. A.



WEEKLY LABORATORY AVERAGES

FACTORY
WEEK ENDING

Cossettes—% Sugar
—App. Pur.
Diffusion Juice—Refr. Brix
—App. Pur.
Maximum Battery Temp. °C
Sugar Losses—% on Beets:
Battery I—Pulp
—Pulp Water
Battery II—Pulp
—Pulp Water
Lime Flume
Steffens Waste Water
Total
Alkalinity—First Press Juice
—Second Press Juice
Lime Salts—Second Press Juice
—Evap. Thin Juice
—First Liquor
pH—Diffusion Juice
—Second Carb. before Soda
—Thin Juice Entering Evaps.
—Thick Juice Leaving Evaps.
—First Liquor after Presses
—Intermediate Green Syrup
—Raw Fillmass
—Molasses Produced
Lime Kiln Gas—CO_2
First Lime Cake—Total Sugar
—CaO
Lime Flume—Total Sugar
—CaO
—Sugar to 100 CaO
Lime Milk or Sacch. Milk:
Brix
CaO in 100 ml.
Thin Juice—Refr. Brix
—App. Pur.
Thick Juice—Refr. Brix
—App. Pur.
First Liquor—Refr. Brix
—App. Pur.
High Raw Sugar Melter—Refr. Brix
—App. Pur.
Low Raw Sugar Melter—Refr. Brix
—App. Pur.
White Pans—Cu. Ft. Fill. per ton Bts.
—Hours Boiling
—Refr. Brix
—App. Pur.
—High Green App. Pur.
—High Wash App. Pur.
—Qts. W. W. per Mach.
—Temp. Wash W. °C
Sugar Skd.—Moist. Leav. Cent.
—Moist. as Sacked
—Temp. as Sacked °C

Sugar Skd.—Ash
—SO_2 P. P. M.
—Foam Test
—Sugar Grade
—Ret. on 30 Mesh
—Ret. on 100 Mesh
—Thru 100 Mesh
Intermediate Pans:
Cu. Ft. Fill. per ton Beets
Hours Boiling
Refr. Brix
App. Pur.
Green App. Pur.
% Cryst. on Sugar
High Raw Sugar—Refr. Brix
—App. Pur.
Raw Pans to Crystallizers:
Cu. Ft. Fill per ton Beets
Hours Boiling
Refr. Brix
App. Pur.
Temp. Dropped °C
Raw Pans from Crystallizers:
Refr. Brix In
Refr. Brix Out
App. Pur.
Hours in Cryst.
Temp. Enter. Cryst.
Temp. Leaving Cryst.
Temp. as Spun °C
% Cryst. on Sugar
Low Raw Sugar—App. Pur.
Molasses—Refr. Brix
—Dir. Pol.
—App. Pur.
Molasses Worked—Refr. Brix
—Polarization
—App. Pur.
Cooler Solution—Refr. Brix
—Alkalinity
—Polarization
W. W. to Heater—Refr. Brix
—Alkalinity
—Polarization
W. W. to Sewer—Refr. Brix
—Alkalinity
—Polarization
Cold Sacch. Cake—Polarization
—CaO
—CaO to 100 Sug.
—App. Pur.
—Perf. Wash. App. Pur.
Hot Sacch. Cake—Polarization
—CaO
—CaO to 100 Sug.

Hot Sacch. Cake—App. Pur.
—Perf. Wash. App. Pur.
Sacch. Milk—Polarization
—App. Pur.
Lime Powder—Loss on Ignit.
—CaO by Titr.
—Coarser than 200 Mesh
Lbs. Coss. per Cu. Ft. Cell Cap.
Tons Cossettes per Cu. Ft. Cell Cap. per 24 Hrs.
Battery Supply Pressure
Draft by Sugar Content
Cutter Knives Divs.
Total CaO % on Beets
Bags Sugar per 100 Cu. Ft. Fill.
Raw Fill.—% Dry Substance
—True Purity
—Raffinose on D. S.
Molasses Prod.—True Purity
—Invert on D. S.
—Raffinose on D. S.
Disc. Mol. Prod. % on Mol. Wkd.
Cold Sacch. Cake—True Purity
Avg. Temp. Cooling Water °C
Avg. Temp. W. W. from Heater °C
Limerock—% on Mol. Wkd.
Lime Add.—% on Sug. in Mol. Wkd.
Temp. Battery Supply
Temp. Raw Juice Leav. Battery
Temp. Raw Juice Leav. Heaters
Temp. Juice Enter. First Presses
Temp. Juice Leav. Second Carb.
Temp. Juice Enter. Evaps.
Coke—% on Limerock
Lbs. Sulphur per Ton Beets
Lbs. Soda per Ton Beets
Lbs. Filter Aid per Ton Beets
Lbs. Carbon per Ton Beets
Lbs. Carbon per Bag Sugar
Pulp % Moisture—After Presses
—As Sacked
% Mol. on Dried Mol. Pulp
Standard Fuel % on Pulp
Standard Fuel % on Beets
Standard Fuel % on Sugar
M. B. T. U. per Bag Sugar
Steam % on Beets
Steam % on Sugar
Lbs. Water Evap. per 10,000 B. T. U.
Boiler Rating
Boiler Efficiency
Boiler Pressure
Flue Gas Temp. °F.
Boiler Feed Temp. °C.
Man-Hours—per Ton Beets
—per Bag Sugar

Fig. 19 Weekly laboratory averages report.

This accounting is kept on forms such as the following:

- Sugar in process inventory
- Extraction statement (fig.17)
- Daily molasses record
- Molasses balance statement
- Daily packaged sugar weight report
- Daily record of supplies

Numerous chemical tests and analyses of all phases of operations are being conducted continually for both control and improvement of operations. A few of the forms used are listed below:

- Limerock analysis
- Coke analysis
- Molasses analysis
- Boiler water analysis
- Beet laboratory report
- Bacterial analysis
- Daily and weekly laboratory analysis (fig. 18)
- Laboratory foreman's report

As evidenced by this partial list of reports, the majority of which are filled in daily, the control over the process from analysis of tabulated data plays a very important part in the operations of the refinery. It may be concluded that such close control is the major factor contributing, within the limits set by type of equipment, to the efficiency of extraction of sugar from the beets.

Case Study Data on
Productivity and Factory Performance

BEET SUGAR REFINING

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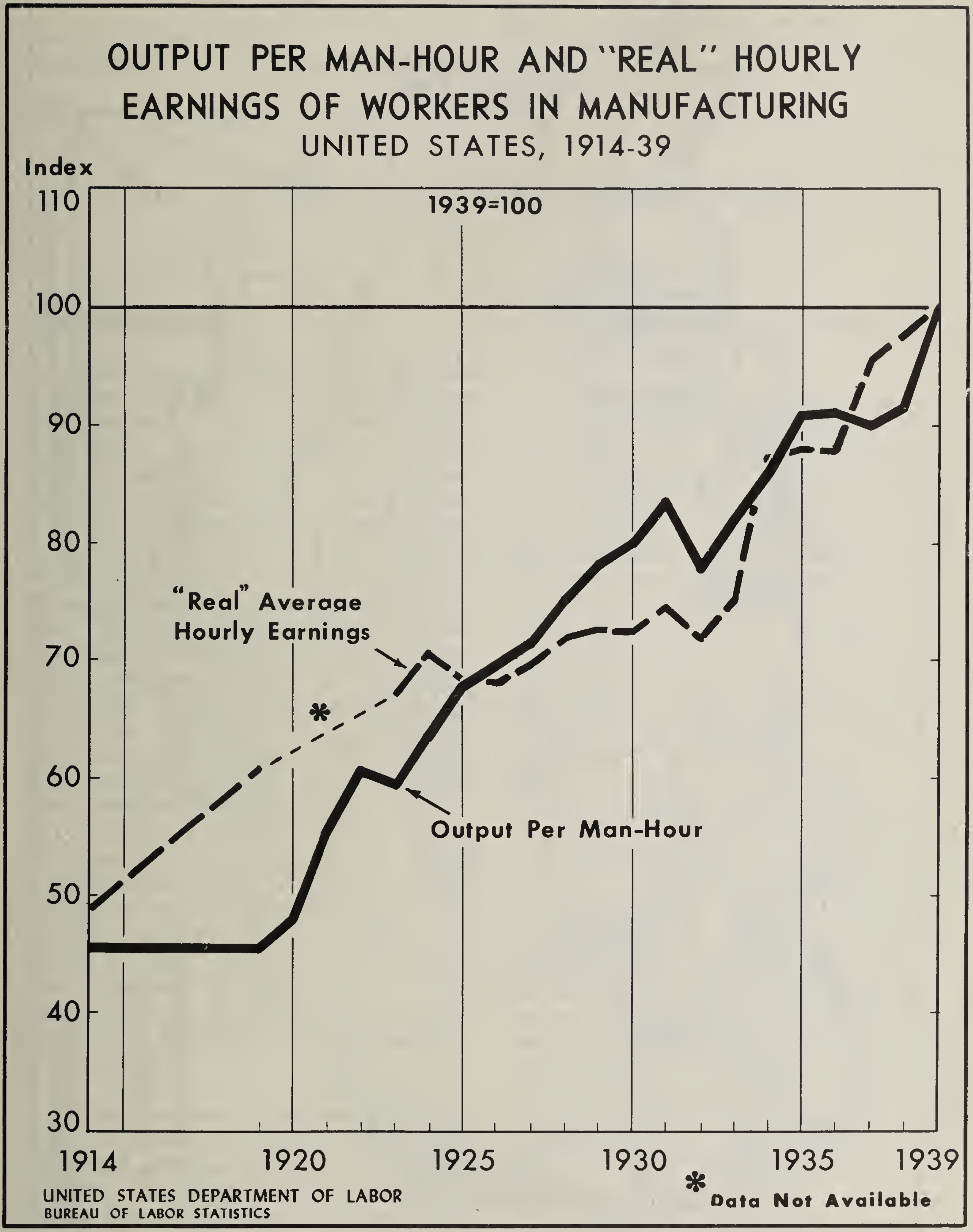
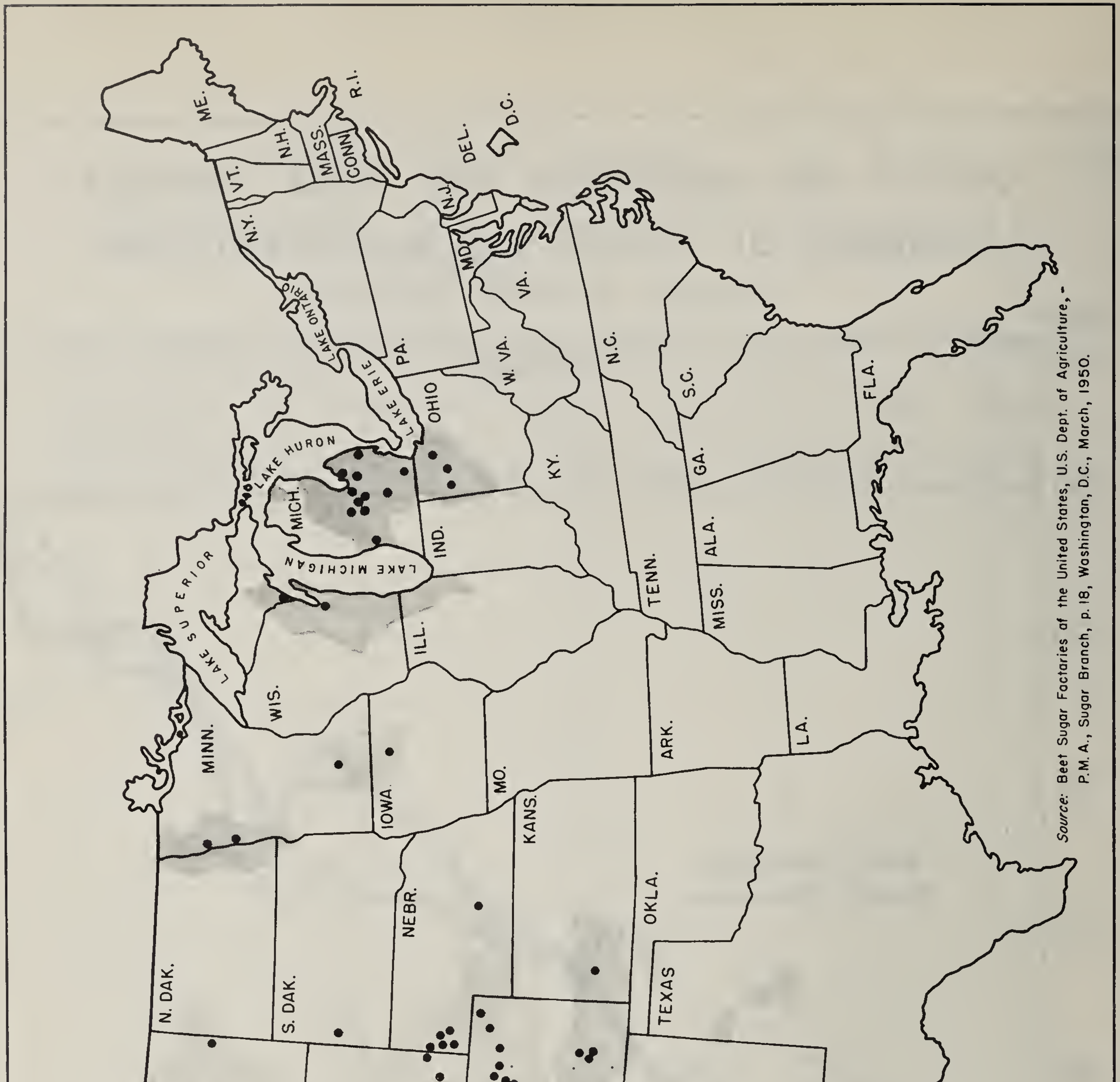

OUTPUT PER MAN-HOUR AND "REAL" HOURLY EARNINGS OF WORKERS IN MANUFACTURING
UNITED STATES, 1914-39
Index
1939=100
110
100
90
80
70
60
50
40
30
"Real" Average Hourly Earnings
Output Per Man-Hour
*
1914
1920
1925
1930
1935
1939
UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
* Data Not Available

Fig. 20



Source: Beet Sugar Factories of the United States, U.S. Dept. of Agriculture, - P.M.A., Sugar Branch, p. 18, Washington, D.C., March, 1950.

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

Fig. 21 Location of sugar beet production areas and beet sugar refineries, U. S. A.

CHAPTER III: LABOR AND MANAGEMENT POLICY

Labor Background

Workers' earnings, like those of other groups in the United States, have increased with time in real as well as in monetary terms as a result of almost continuous improvements in productivity. The Bureau of Labor Statistics estimated that from 1909 to 1947, the average real weekly earnings of factory workers doubled whereas hours worked per week declined by a fifth. These substantial improvements in income could not have been achieved without increased output per man-hour of work made possible by a constantly improving technology of production. Although all workers have benefited from greater productivity, workers in industries with strong unions have generally shared larger gains from increased productivity. In addition to greater weekly pay and shorter hours per week, workers have chosen to take some of the returns from greater productivity in the form of fringe benefits such as paid holidays, vacations, pensions, and rest periods.

Despite the advantages arising from technological change, both organized and unorganized labor have on many occasions in the past resisted the introduction of new methods of machinery because of the threat of unemployment. Examples of management and labor working together in successfully coping with the problem are given toward the end of this chapter.

The average income levels of workers in American factories and in the beet sugar refining industry, in the period since 1939, are indicated in table 12. In table 12 an attempt is made to eliminate any confusion arising from different currencies by showing the cost of common commodities in terms of the minutes of work required of the average factory worker for his purchase. The pattern of increasing real income portrayed in figure 19 and table 11 for the 25 years before 1939 has continued in the period since that year. Average hourly earnings of workers in beet sugar refining were $1.493 in 1951, an increase of 1.552 percent over the $0.585 an hour in 1939 (table 12). In this period the Consumers' Price Index rose 89 percent whereas the average hours worked a week increased from 37.7 in 1939 to 40.7 in 1951. The much larger increase in wages than in prices together with relatively full employment throughout the post World War II period indicates an appreciable gain in real earnings which determine the workers' standards of living.

Industry Background

The beet sugar industry in the United States is geographically dispersed in a wedge-shaped area having its apex in the Michigan-Ohio region

Table 11. Indexes of productivity and real hourly earnings in the United States, selected years, 1914-39

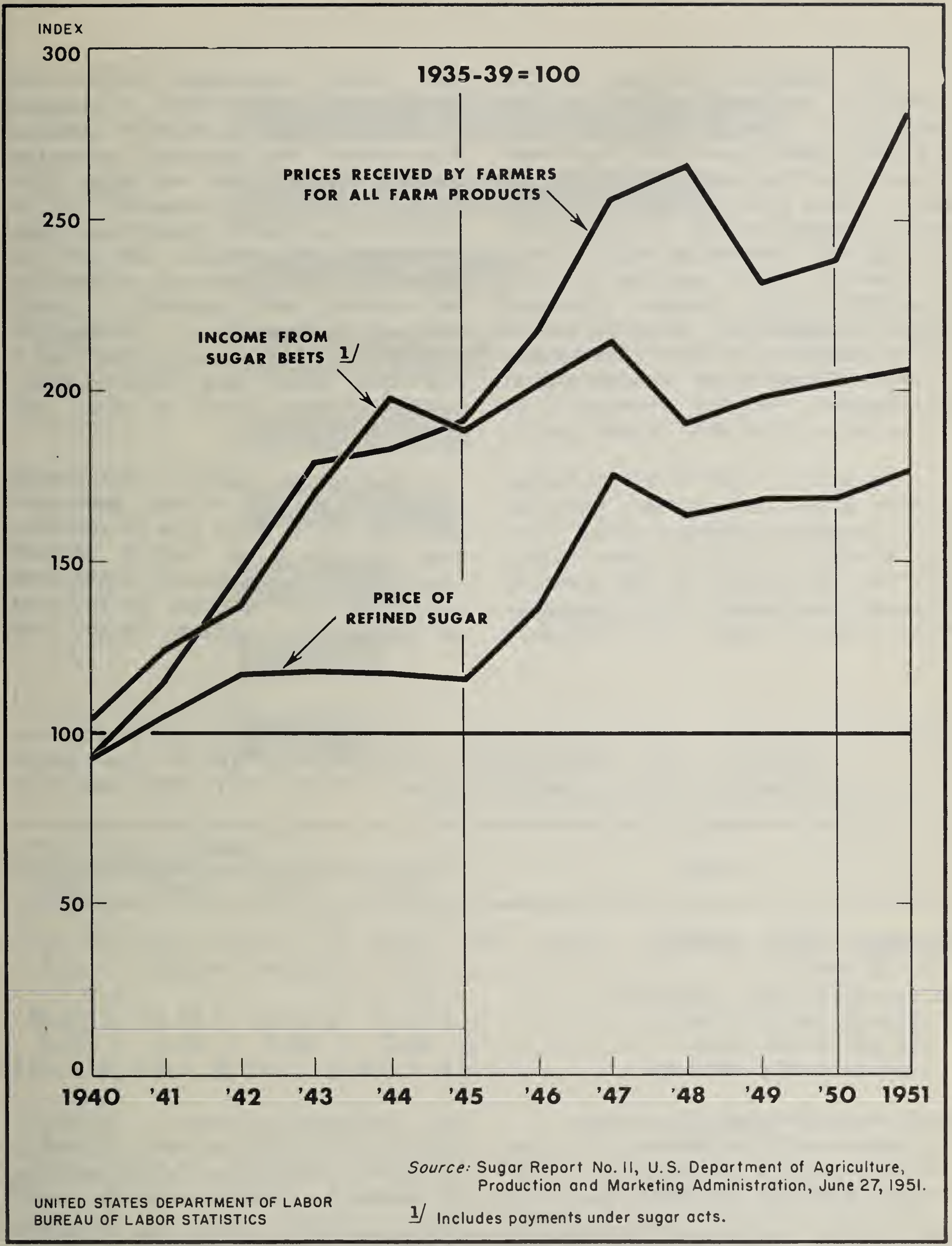
Year	Index of output per man-hour, all manufacturing	Index of average hourly real earnings
	(1939=100)	
1914 . .	45.5	48.8
1919 . .	45.3	60.4
1920 . .	48.0	(1/)
1921 . .	55.2	(1/)
1922 . .	60.5	(1/)
1923 . .	59.5	67.2
1924 . .	63.4	70.3
1925 . .	67.6	68.4
1926 . .	69.5	68.1
1927 . .	71.3	69.7
1928 . .	75.1	71.9
1929 . .	78.1	72.5
1930 . .	80.0	72.5
1931 . .	83.5	74.4
1932 . .	77.6	71.7
1933 . .	81.9	75.0
1934 . .	85.9	87.3
1935 . .	90.8	88.1
1936 . .	91.0	88.1
1937 . .	90.0	95.4
1938 . .	91.6	97.6
1939 . .	100.0	100.0

1/ Information not available.

and its base along the west coast. Within this perimeter, which covers roughly 16 States, 19 beet sugar processing companies operate some 78 factories, produce some 1,200,000 to 2,000,000 short tons of refined sugar, and supply about 25 percent of the domestic market.

Several unique features characterize the industry: (1) The processing of sugar is dependent upon an agricultural raw material, sugar beets, thus making the industry highly seasonal; (2) Production fluctuates from year to year. Farmers are independent producers faced with price alternatives between competing crops for the use of land, which accounts for the varying number of farmers (75,000 to 100,000) and of total acreage (800,000 to 1,000,000) from year to year. Also, the industry is dependent upon the weather, water for irrigation, and other factors surrounding the problems of crop growing. The average yield ranges from 10 to 14 tons per acre; (3) Strong trade associations in the industry present an unusually united front; (4) A high degree of competition prevails because beet sugar must compete with tropical cane sugar produced with cheap labor; hence, its competitive disadvantage lies mostly in the comparatively high standard of living which it supports; (5) The major outstanding feature is the industry's status of a "protected industry" throughout its existence.

The growth of the beet sugar industry parallels the agricultural development of sugar beets. The first experimental attempt to produce beet sugar was initiated by the Beet Sugar Society of Pennsylvania in 1836. In 1838 another attempt was made at Northampton, Mass. From 1836 to 1879 all of the 14 small American beet sugar plants failed. Beet sugar production in the United States was put on a large-scale basis shortly after 1890 when development of technique and skill in the growing of beets and in the methods of processing made large operations feasible.



Source: Sugar Report No. 11, U.S. Department of Agriculture, Production and Marketing Administration, June 27, 1951.

1/ Includes payments under sugar acts.

Fig. 22 Percent change in sugar prices and growers' income, U. S. A., 1940-50.

Two distinct periods in the growth of the industry are distinguishable. Between the years 1899 and 1921 there was a 206.7-percent increase in the number of establishments. This increase was due to the rapid progress in the technology of growing and processing sugar beets. The second phase extends roughly from 1921 to the present time and might be termed the maturing period of the industry in which the number of establishments has been relatively constant, varying between 75 to 85 factories over the 30-year period.

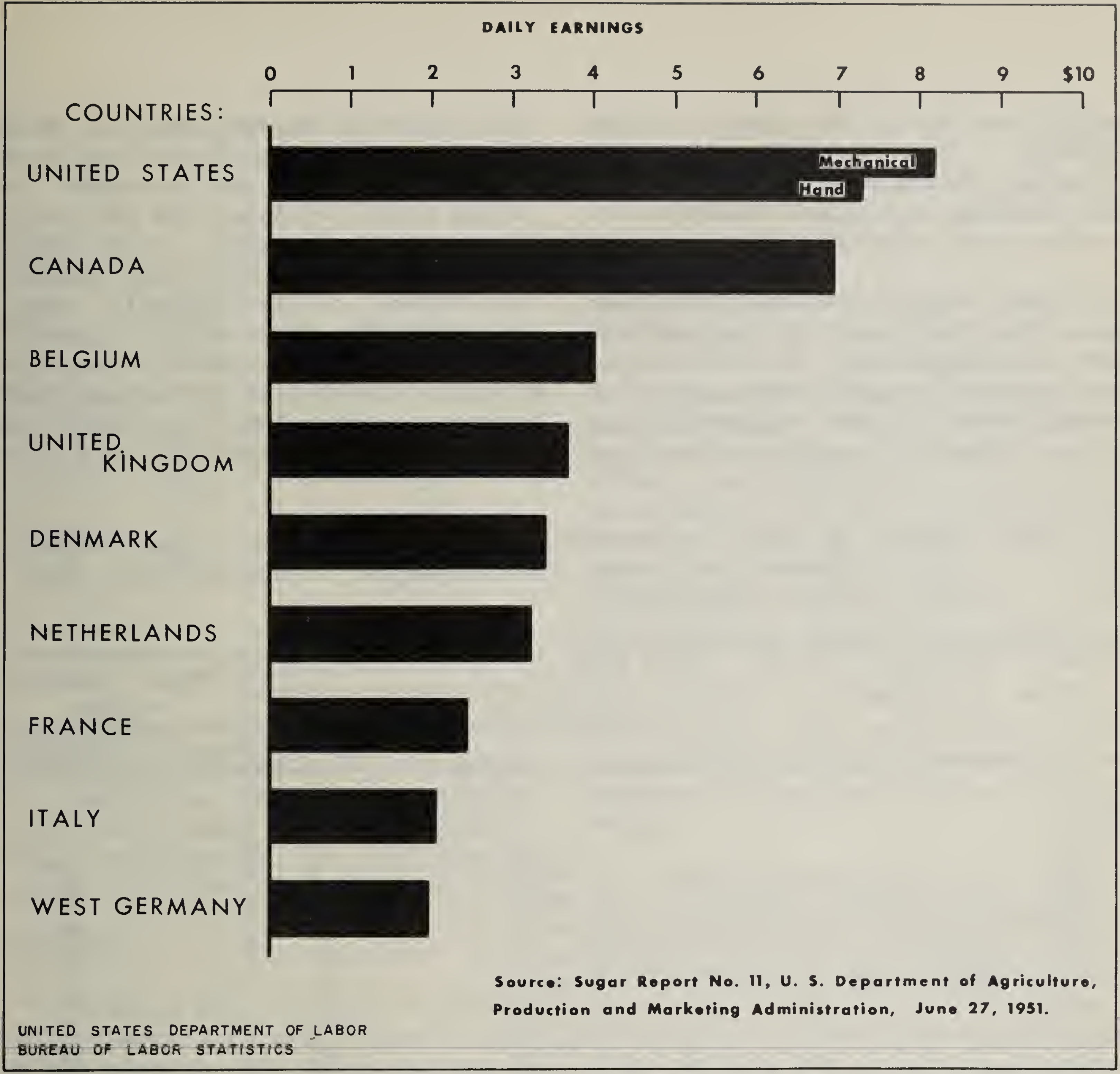
In 1950, there were 78 factories in the United States, operated by 19 companies having a total slicing capacity of 148,350 short tons. More than 70 percent of this capacity is under the control of 5 companies which operate from 5 to 20 refineries. Many advantages are derived from the centralization of management, including comparative production control and analysis, extensive research facilities, and wider dissemination of improvements. In a period of low beet production, some refineries of a company are not operated so that remaining refineries may operate near capacity. Total average employment of production workers in the industry for the 4 preceding years was 9,800 in 1948, 8,900 in 1949, 10,000 in 1950, and 9,400 in 1951.

Refineries operate continuously during the period of the beet harvest and for a short time thereafter. The "campaign," or period of beet sugar refining, generally lasts from 50 to 120 days; only in the far west do operations continue longer than

Table 12. Consumer Price Index, hours, and gross earnings of production workers in all manufacturing industries and in the beet sugar industry, U. S. A., annual average of 1939, 1947, 1950, and 1951

Item	Year			
	1951	1950	1947	1939
Consumers' price index 1/ (1935-39=100)	185.6	171.9	159.6	99.4
All manufacturing industries				
Average weekly earnings	$ 64.88	$ 59.33	$ 49.97	$ 23.86
Average weekly hours	40.7	40.5	40.4	37.7
Average hourly earnings	$ 1.594	$ 1.465	$ 1.237	$ .633
Beet sugar industry				
Average weekly earnings	$ 61.36	$ 58.69	$ 48.48	$ 24.68
Average weekly hours	41.1	42.5	41.5	42.9
Average hourly earnings	$ 1.493	$ 1.381	$ 1.170	$ .585

1/ Consumer Price Index for moderate-income families in large cities as collected by U. S. Department of Labor, Bureau of Labor Statistics, Division of Prices and Cost of Living.



Source: Sugar Report No. 11, U. S. Department of Agriculture, Production and Marketing Administration, June 27, 1951.

Fig. 23 Daily earnings of sugar beet harvest workers, 1950 crop, by selected countries.

3 months. After the campaign, the labor force is reduced to key workers, including superintendents, chief foremen, electricians, mechanics, chemists, and office workers. Most of these workers devote themselves mainly to repair and maintenance work in preparation for the next season.

Historically, the sugar industry of the United States has received the benefits of a tariff for more than 70 years, the first tariff being put into effect in 1879. Early tariffs were primarily for revenue purposes and afforded little protection to producers. The present rate of 1/2 cent a pound on Cuban raw sugar is about the lowest in our history. This protection is small, however, in comparison to the assistance given by many countries to their sugar industries.

The Sugar Act of 1948 places upon the Secretary of Agriculture the responsibility of determining during each December the quantity of sugar needed in the following year to meet the requirements of consumers in continental United States. This quantity must provide a supply of sugar that will be consumed at prices which will not be excessive to consumers and which will fairly and equitably maintain and protect the welfare of the domestic sugar industry. The Secretary of Agriculture is required to use the quantity of sugar distributed for consumption between November 1950 to October 1951 as a basis for determining the 1952

Table 13. Amount of work time required of average American factory worker and of average beet sugar industry worker to buy selected food and clothing items, 1947

Item	Unit of measure	Factory worker		Sugar industry worker	
		Hours	Minutes	Hours	Minutes
Food:					
Milk	1 liter		9		10
Eggs	1 dozen		34		36
Oranges	1 dozen		21		22
White flour	1 kilo.		11		12
White wheat bread	1 kilo.		13		14
Butter	1 kilo.	1	28	1	33
Salt pork	1 kilo.		49		52
Potatoes	1 kilo.		7		8
Coffee	1 kilo.		51		54
Clothing:					
Men:					
Heavy wool suit	1	36	43	38	4
Work shirt	1	1	19	1	24
Socks	1 pair		16		17
Street shoes	1 pair	6	32	6	54
Work shoes	1 pair	5	56	6	16
Women:					
Wool coat	1	17	53	18	54
Street dress	1	8	20	8	49
House dress	1	2	31	2	40
Rayon and Nylon stockings	1 pair		53		56
Street shoes	1 pair	5	26	5	45

Table 14. Average weekly hours and hourly earnings in selected companies manufacturing beet sugar, U.S.A., 1951

Plant	Average weekly hours	Average hourly earnings
A . .	(1/)	(1/)
B . .	(1/)	(1/)
C . .	37.1	$ 1.567
D . .	51.6	1.494
E . .	(1/)	(1/)
F . .	42.0	1.638

1/ Not available.

requirements. He must also make allowances for deficiency or surplus in inventories, changes in population, and changes affecting demand. These requirements are published as quotas for sugar producing areas.

Marketing

Because all sugars are chemically identical, beet sugar is sold in the markets of this country in competition with sugar refined from raw cane sugar. The normal marketing area of the western beet sugar industry extends from the west coast to Chicago and south into Texas. Sugar produced in the North Central States is marketed in the local area. In the eastern seaboard and Gulf areas the market for beet sugar is absent, because it comes into contact with competition from cane sugar.

Refined beet sugar moves directly to market or is stored in packages in warehouses and in bulk storage bins. Packaged sugar moves in units of from 1 to 100 pounds, bulk sugar in units of from 2,000 pounds to carloads of 100,000 pounds. The mode of moving sugar to market is by rail and truck from the factory warehouses.

Sugar inventory is at a maximum at the close of the operating season. From the end of the campaign to the beginning of the next campaign the sugar inventory is gradually liquidated through sales. These inventories must supply the market until the beginning of the processing of the next beet crop. About 20 to 25 percent of the new sugar is sold in the calendar year in which it is made--between October and January. The other 75 or 80 percent is marketed during the following 9 months. Unsold sugar from the previous campaign places a burden on the following year's inventory with respect to sales.

Although wholesalers and industrial consumers may buy their sugar directly from the processors, most of the refined sugar distributed in the United States is sold through independent brokers whose principal sales outlets are wholesale grocers, manufacturers, and chain stores.

Because beet sugar cannot be sold at a higher price than that charged by cane sugar processors, the base-point system and the actual methods of price quotation with a small differential of 1/5 cent a pound determine the delivered price of beet sugar.

Unionism in Beet Sugar Industry

Workers of the beet sugar industry are organized under the Beet Sugar Federal Labor Unions and affiliated with the International Council of Sugar Workers of the American

Table 15. Number of establishments, number of wage earners, wages paid, and value of products in the beet sugar industry, U.S.A., 1899-1947 1/

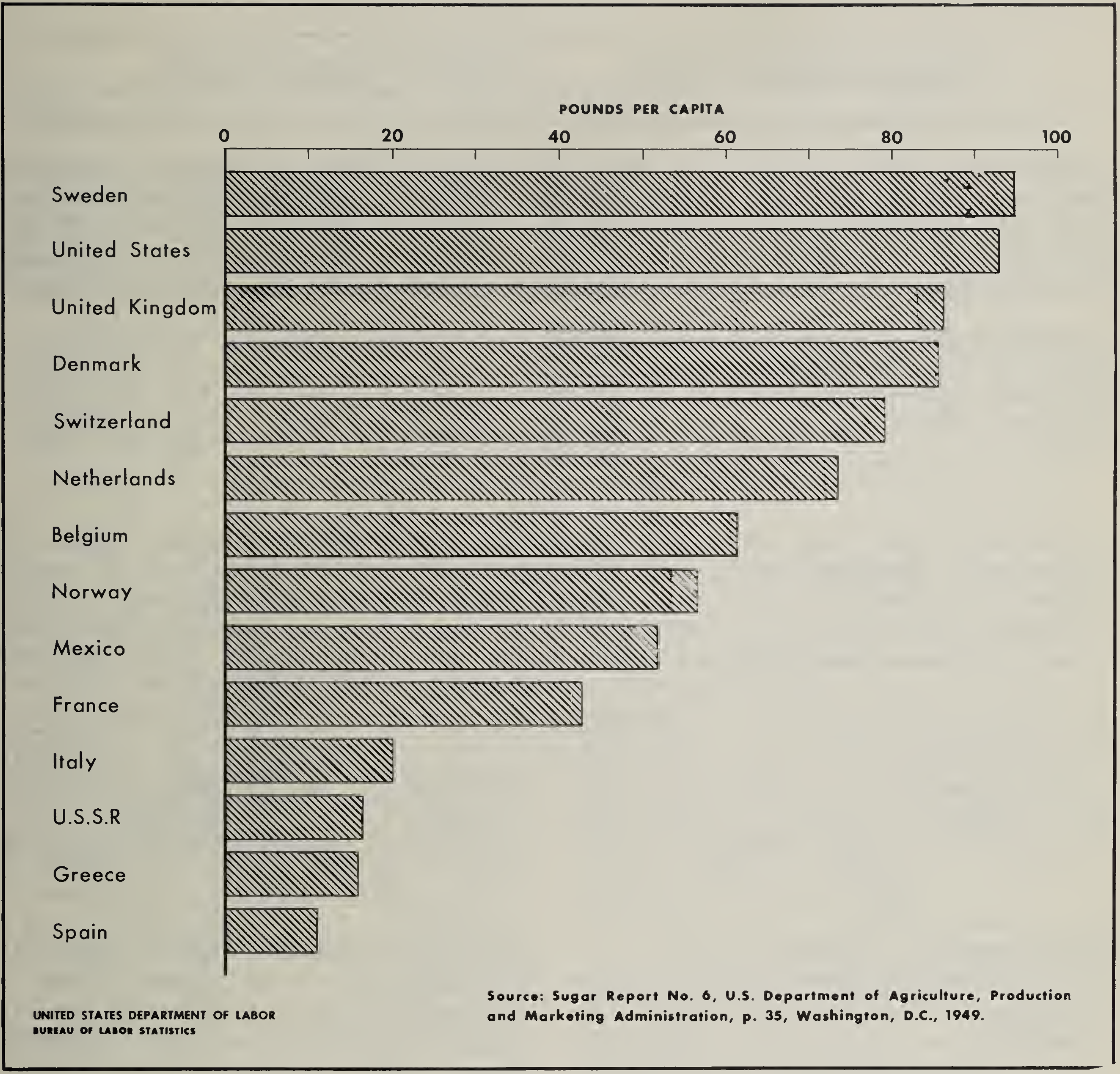
Year	Number of establishments	Number of wage earners (yearly average)	Total wages and salaries paid	Value of products shipped	Percentage wages to value of product
1899 . .	30	2,320	$1,449,000	$7,324,000	19.78
1904 . .	51	4,726	3,491,000	24,394,000	14.31
1909 . .	58	8,388	6,578,000	48,122,000	13.67
1921 . .	92	16,008	27,643,000	139,110,000	19.87
1929 . .	82	8,943	12,819,000	108,553,000	11.81
1935 . .	77	10,798	12,532,000	82,000,000	15.28
1939 . .	85	12,324	16,408,000	117,000,000,	14.02
1947 . .	74	13,412	35,569,000	262,872,000	13.53

1/ 1947 Census of Manufacturers: Sugar: Confectionery and Related Products, p.2.

Federation of Labor. The first local in the industry was chartered on September 18, 1933. Since that time the number of unionized plants has steadily increased, and as of March 1951 there were 67 such locals chartered in the 78 establishments of the industry. The rate of growth has fluctuated over the period. From 1933 until 1937 only 8 locals had been chartered in the industry. Between 1937 and 1938, however, the number of plants organized increasing by 25, and between 1938 and 1950 only 34 plants were unionized.

The seasonality of the industry is one of the chief reasons it has taken the sugar workers a long time to unionize. The sugar process campaign usually extends from October through January. With the end of the campaign, the labor force is considerably reduced leaving only a cadre consisting of supervisors and maintenance employees. In its 1951 report, the Sugar Division of the CIO explicitly gave this reduction in force as its reason for not organizing the workers in this industry.

The material concerning labor management agreements presented in the following pages and tabulated in Appendix I can be interpreted as representing generally the contents of the labor-management agreements in the beet-industry areas of the West Coast, Rocky Mountains, and of the North Central States.



Source: Sugar Report No. 6, U.S. Department of Agriculture, Production and Marketing Administration, p. 35, Washington, D.C., 1949.

Fig. 24 Refined sugar consumption, selected countries, 1948.

Table 16. Monthly salary by indirect occupation in 5 selected plants, U. S. A., 1952

Classification	Monthly salary in plant				
	A	B	C	D	F
Chief electrician	$354.64	$350.00	$416.00	$350.00	$416.00
Beet end foremen	344.24	338.00	387.00	338.00	387.00
Sugar end foremen	344.24	338.00	387.00	338.00	387.00
Sugar boilers	336.96	328.00	381.00	328.00	381.00
Machinist-shop	336.96	343.00	376.00	343.00	376.00
Instrument man	336.96	--	--	--	--
Agricultural shop foreman . .	336.96	--	--	--	--
Warehouse foreman	336.96	--	--	--	--
House mechanics	332.80	333.00	376.00	333.00	376.00
Welders	329.68	--	--	--	--
Electricians	328.64	--	381.00	--	381.00
Boilerhouse foremen	316.68	--	--	--	--
Assistant chemists	313.56	305.00	379.00	305.00	379.00
Draftsmen	296.92	--	--	--	--
Extra station men (over 3 yrs.)	294.84	--	334.00	--	334.00
Belt dump repairmen	293.80	--	--	--	--
Storekeeper	290.68	--	350.00	--	350.00
General foreman	--	360.00	--	360.00	--
Shop foreman	--	350.00	--	350.00	--
Boilerhouse foreman - first .	--	333.00	350.00	333.00	350.00
Electrician - first	--	333.00	--	333.00	--
Crane operator - first	--	333.00	334.00	333.00	334.00
Shift mechanic - first class .	--	343.00	--	343.00	--
Pipefitter - first	--	333.00	--	333.00	--
Carpenter	--	333.00	376.00	333.00	376.00
Welder - first	--	333.00	376.00	333.00	376.00
Blacksmith	--	333.00	350.00	333.00	350.00
Boilerhouse foreman - second .	--	322.00	--	322.00	--
Pulp drier foreman	--	313.00	381.00	313.00	381.00
Sugar warehouse foreman . . .	--	301.00	--	301.00	--
Pulp warehouse foreman	--	289.00	--	289.00	--
Yard foreman	--	289.00	334.00	289.00	334.00
Assistant chemist for waste water	--	285.00	--	285.00	--
Assistant storekeeper	--	272.00	275.00	272.00	275.00
Steffens house foreman	--	--	381.00	--	381.00

Table 16. Monthly salary by indirect occupation in 5 selected plants, U.S.A., 1952--Continued

Classification	Monthly salary in plant				
	A	B	C	D	F
Second assistant chemist . . .	--	--	$358.00	--	$358.00
Second electrician	--	--	332.00	--	332.00
Millwright	--	--	400.00	--	400.00
Beltman	--	--	332.00	--	332.00
Pipefitters	--	--	376.00	--	376.00
Refrigeration engineer	--	--	372.00	--	372.00
Ice machine operator	--	--	350.00	--	350.00
Students	--	--	289.00	--	289.00
Truck mechanics	--	--	320.00	--	320.00

Agreements generally run from August 1 to July 31 of the following year. When in effect, these agreements shall remain in force and be binding upon the parties for the period, during which time employers agree to meet all obligations and pay schedules explicitly stated in the contract. Obligations binding the union are such that there will be neither work stoppage nor curtailment of production in any way by strikes, walk-outs, or willful malingering.

Most plants are union shops. Employers agree that employees who are subject to the provisions of the respective agreements and who are not already members of the union shall make application to the union within 30 days. Failure to join the union at the end of this period renders the employee liable for discharge. Employers assume the responsibility of collecting union dues from their employees on behalf of the unions. Moreover, employers shall not discharge or discriminate against an employee for union activities, upholding union principles, or serving on a committee of the union or of any AFL organization.

The wage structure of the industry is characterized by the use of the time-rate method of wage determination - the predominance of single scales by occupation within plants, and the widespread use of collective bargaining in rate determination are the rule. Incentive methods of pay and piece work are notably absent. The wage rates named in the specific agreements are minimum wages and are not in any way considered to be an upper limit in the rates.

In addition to the exclusive use of time rates, single rates are established for groups of occupations including those that are technical. Moreover, the tendency is for these wage-rate differentials between groups to be less and less pronounced, approaching a homogeneous wage-rate condition. In table 16 occupations and time rates are tabulated for five selected plants.

Related wage practices such as shift-pay differential, have been absent in all wage contracts except on the west coast. Other fringe benefits like paid vacations, paid holidays, overtime rates, sick benefits,

Table 17. Beet sugar and total sugar deliveries, by type of product or business of buyer, U.S.A., 1951

(In cwt.)

Product or business of buyer	Beet sugar deliveries	Total sugar deliveries
Total deliveries	30,296,562	138,879,169
Bakery, cereal, and allied products	4,264,056	12,444,449
Confectionery and related products	2,675,390	12,450,059
Ice cream and dairy products	1,530,648	5,140,380
Beverages	2,721,795	14,404,373
Canned, bottled, frozen foods; jams, jellies, preserves	3,458,450	11,165,275
Multiple and all other food uses . .	1,010,551	4,925,558
Nonfood products	18,940	793,859
Hotels, restaurants, institutions .	70,593	575,529
Wholesale grocers, jobbers, sugar dealers	11,134,612	54,217,502
Retail grocers, chain stores, super markets	2,834,950	20,514,977
All other deliveries, including deliveries to Government agencies	576,577	2,247,208
Deliveries in consumer-size packages (less than 100 pounds)	7,712,805	50,595,077

Source: Sugar Report No. 15, Production and Marketing Administration, U. S. Department of Agriculture, April 9, 1952.

pensions, and free services are provided in the workers' agreements. Table Ic in appendix I indicates the extent of these benefits.

Although in recent years there has been a growing preoccupation for American unions to provide for elaborate hospitalization, insurance, and pension plans in collective bargaining agreements for all workers because of the brief period of employment, it is virtually impossible to incorporate such extensive benefits in the agreements of beet sugar industry workers, except for the year-round employees. Nevertheless, the sugar unions are pressing for some kind of plans, and the industry seems receptive to them.

Employer-union cooperation is furthered between employer and employee by providing union representation on the safety committee of each plant.

In most beet sugar agreements, management's right to institute technological changes is explicitly stated in writing. The following statement is found in the agreements. "The employer shall be free at his discretion, and without interference from the Union, to introduce labor-saving devices or new processes, provided they are not inimical to the safety and health of the employees."

Adjustment to Technological Change

Labor and management in the United States have always been faced with problems arising from changes in processes and the introduction of new machinery. The problems generally include determination of earnings, workloads, work schedules, displacement of special skills by new machinery and methods, and, in some cases, actual displacement of workers. Over the past 25 years, with the more rapid growth of labor unions, adjustments and solutions to these problems have been reached in many instances on a case-by-case basis as a result of negotiations between the two parties. The success of the solutions and adjustments has depended almost entirely on the attitudes and procedures with which labor and management approached each case and only incidentally on the technical details of the change itself.

Moreover, negotiations over technological change in many fields of manufacturing indicate that the experience gained from a case in one industry is applicable to problems of change in other industries. Consequently, the methods and ideas developed in negotiations over technological change are used in many industries in addition to the one in which a problem first appeared. Technical details concerning machines, processes, and conditions of employment still require agreement on a case basis within the framework of ideas and methods handed down from past experience.

The examples of adjustment to technological change that follow have been selected because of the techniques and procedures they illustrate, without regard to the industry in which they occurred.

Example A 7/

The union has not challenged management's right to introduce new machinery or methods or to set the speed of work, in part because the stability of employment and the gradual expansion of the industry have not threatened the security of the individual worker. At the same time, most of the improvements have made the work easier and, because of increased mechanization, some have resulted in higher job rates under a job evaluation program which places emphasis on responsibility. Management has also retained the right to hire, partly because the slow inflow of new workers has constituted no threat to the unions. Nor have the unions sought to represent the foremen, partly because the foremen were no threat to the unions because of the generally favorable attitude of management toward the unions.

Certainly, management in pulp and paper no longer enjoys unrestricted powers. It has yielded its traditional rights chiefly in those fields now generally conceded to be subject to collective bargaining: wages, hours, vacations, and the like. Only in the joint safety program has it gone beyond the customary boundaries. Management has retained the essential right to direct, and the necessary powers to operate efficiently - the right to hire, to discharge for cause, to promote partly on the basis of efficiency, to change methods and machines, to set output

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7/ Abstracted from Case Study No. 1, Crown Zellerbach Corp. and the Pacific Coast Pulp and Paper Industry; Causes of Industrial Peace, National Planning Association.

standards, to exercise sole control over foremen, and to have work proceed without interruption. At the same time, consultation with the unions has been widely practiced and management has discussed many problems with them on which it has the sole discretion to make decisions. Almost without exception, plant managers assert that time spent in conference with union representatives is not a grudging concession but a real investment paying steady dividends.

If sovereignty of management means retaining those powers essential to the achievement of quantity and quality of production, then little, if any, real impairment of it has taken place.

Example B 8/

Steelworkers, in common with all other Americans, naturally welcome increasing labor productivity, if only because they realize that it augments the fund from which higher living standards may be realized. Yet increasing labor productivity, whether reflecting technological improvements or more effective human teamwork, also arouses the worker's natural fear of demotion or displacement. The steel industry has not yet solved this long-standing human problem or even approached it as broadly as has the automobile industry in the General Motors contract of 1950.

Nevertheless, both management and union leaders at Minnequa are making a sincere effort to minimize the adverse effects on workers of introducing modernized and improved mechanical and human teamwork processes. This is reflected in the care with which incentives arrangements and seniority problems were handled when a new Morgan rod mill was installed at the Minnequa plant in 1949. 9/ The same case illustrates the painstaking attention which is given to the classification of jobs involving new processes. Technological displacement was handled by the parties in conformance with a subsection of the contract's seniority clause, which outlines a procedure of mutuality in the instance of interplant transfers required by additions of new plants and discontinuance of other plants.

After the new mill was put into operation following the voluntary shift of workers from the old rod mill, unexpected problems had to be resolved, and these were still being straightened out 8 months after installations had been completed. The mill not only ran at partial capacity for some time, but also job classifications were tentative, and incentive standards were temporarily held in abeyance, with retroactive pay to be based on production records from the time the mill started.

The union accepted the company's tentative job classifications with the understanding that time would be allowed for workers to become fully acquainted with their work. This involved no demotions, but take-home

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8/ Abstracted from Case Study No. 9, Minnequa Plant of Colorado Fuel and Iron Corporation and two locals of United Steelworkers of America; Causes of Industrial Peace, National Planning Association

9/ Ibid. See discussion in chapter V, p. 50.

pay was decreased in those instances where incentive earnings, temporarily held in abeyance, would have exceeded hourly rates. This was offset to some extent when the 10-hour shifts were adopted, with the contract providing for overtime premiums for work in excess of 8 hours.

In approaching the comprehensive task of establishing job classifications for the new mill, the initial step of management and the union was to reach agreement on job descriptions. Then followed a re-examination of the company's tentative classifications in the light of the agreed-upon job descriptions. Based on the 30 labor grades established by the national committee studying wage inequities, a method of pooled judgment was applied in an attempt to classify the jobs, as mutually defined, into corresponding labor grades. Although the contract provides that in cases of disagreement the company may proceed unilaterally, subject to later appeals through the grievance procedure, every effort was made to reach agreement by this method of pooled judgment which drew on practices in comparable situations in other plants and in the industry generally. Of 23 classifications discussed in April 1950, 10 were accepted by the union without dispute. the company made concessions on 7, and the union provisionally withdrew objections on the remaining 6. The outcome was that many workers were upgraded, owing to the fact that some jobs which were reclassified affected relatively large concentrations of workers. An example was the flying shear job, which was raised from labor grade 9 to labor grade 10 in a mutual attempt to harmonize the new rod-mill rates with rates generally paid for like or similar work. In all of this processing the union did not waive its contractual right for reconsideration in the light of further information or living experience.

Essentially the same mutuality exists at Minnequa in the classification of new jobs as in the reclassification of old jobs affected by technological change or organizational flow changes. In all such proceedings the company's position is based on data prepared by the industrial engineering staff. The union in its turn acts directly through its committee on wage inequities rather than indirectly through the grievance procedure. Sometimes the advice of the United Steelworkers' wage experts is also sought. Thus, both union and management handle the difficult job of dealing with ever-changing job content on a high factual level.

This is a long step forward from the old days in the steel mills, with their scattered wage rates. Today the industry has a simplified, understandable, and comprehensive wage structure based on mutual agreement. This wage structure is by no means rigid, for it serves only as a guide to the classification of particular local jobs. Nor is it a static wage structure, for the parties in their joint wage inequity committees have the means of keeping abreast of changes as they occur. The existance of a guiding wage structure and of arrangements for applying it to changing conditions is a major contribution to industrial peace.

APPENDIX I: SUPPLEMENTARY INFORMATION

Tabulated in tables Ia, Ib, and Ic are the job classifications, wage rates, and fringe benefits of the beet sugar industry workers for the current (1953) year as determined by Union-Management negotiation. The classifications listed in table la are the specific job stations for the technicians of the plants who are generally year-round employees of the factory and whose primary function during the intercampaign period is to ready the plant for the coming campaign season.

Listed in table Ib are the specific job stations of the workers who operate the production end of sugar making during the campaign season: these jobs become nonexistent for the most part during the intercampaign season of the plant.

Listed in table Ic are the fringe benefits of the workers in five selected beet sugar refineries. The benefits listed in this table can be interpreted as representing the entire beet sugar industry.

Table Ia. Hourly rates of technicians in 5 selected beet sugar refineries, U.S.A., 1952

Classification	Hourly rate in plant				
	A	B	C	D	F
Machinists	$1.85	$1.925	$2.03	$1.925	$2.03
Welders	1.85	--	2.03	--	2.03
Pipe fitters	1.85	--	2.03	--	2.03
Electricians	1.85	--	2.03	--	2.03
House mechanics	1.85	--	2.03	--	2.03
Carpenters (outside)	1.85	1.865	2.03	1.865	2.03
Boiler room foremen	1.745	1.865	--	1.865	--
Boiler room operators (1 man per shift)	1.745	--	--	--	--
Crane operators	1.745	--	1.90	--	1.90
Shovel operators	1.745	--	--	--	--
Extra station men	1.655	--	1.79	--	1.79
Locomotive engineers	1.625	1.71	1.79	1.71	1.79
Assistant boiler room foremen . .	1.605	1.775	--	1.775	--
Belt men	1.605	1.71	1.79	1.71	1.79
Assistant electricians	1.605	--	1.79	--	1.79
House mechanics (second class) . .	1.605	1.71	--	1.71	--
Sugar truck driver	1.605	--	1.79	--	1.79
Assistant sugar boiler (2 years and over)	1.575	--	--	--	--
Assistant chemists	1.55	1.60	1.79	1.60	1.79
Assistant sugar warehouse foremen	1.52	--	--	--	--
Sacking station head	1.52	--	--	--	--
Power house foreman	1.52	--	--	--	--
Stationary engineers	1.46	--	--	--	--
Special chemists	1.46	1.495	1.79	1.495	1.79
Truck drivers (beet trailer) . . .	1.43	--	--	--	--
Chief electrician	--	1.945	--	1.945	--
Shop foreman	--	1.945	--	1.945	--
Shift mechanic (first class) . . .	--	1.925	--	1.925	--
Beet end foreman	--	1.89	--	1.89	--
Sugar end foremen	--	1.89	--	1.89	--
First electricians	--	1.865	--	1.865	--
First crane operators	--	1.865	--	1.865	--
First house mechanic	--	1.865	--	1.865	--
First pipefitter	--	1.865	--	1.865	--
First welder	--	1.865	--	1.865	--

Table Ia. Hourly rates of technicians in 5 selected beet sugar refineries, U.S.A., 1952--Continued

Classification	Hourly rate in plant				
	A	B	C	D	F
Blacksmith	--	$1.865	$2.03	$1.865	$2.03
Sugar boiler	--	1.85	1.79	1.85	1.79
Pulp drier foreman	--	1.745	--	1.745	--
$C_{12}H_{22}O_{11}$ warehouse foreman . .	--	1.69	1.79	1.69	1.79
Head assistant chemist	--	1.71	--	1.71	--
Pulp warehouse foreman	--	1.625	--	1.625	--
Yard foremen	--	1.625	1.79	1.625	1.79
Assistant storekeeper	--	1.50	--	1.50	--
Second electricians	--	1.71	--	1.71	--
Second cranemen	--	1.71	--	1.71	--
Second pipefitters	--	1.71	--	1.71	--
Second welders	--	1.71	--	1.71	--
Yard and team	--	1.655	--	1.655	--
Turbine operator	--	1.63	--	1.63	--
Utility foreman	--	1.625	--	1.625	--
Utility man	--	1.60	--	1.60	--
Mechanic helper - first	--	1.60	--	1.60	--
Apprentice sugar boiler	--	1.495	--	1.495	--
Pulp drier fireman	--	1.47	--	1.47	--
Boiler house fireman	--	1.47	--	1.47	--
Head battery	--	1.465	--	1.465	--
Assistant yard foreman	--	1.465	--	1.465	--
Assistant warehouse foreman - year-round sugar and pulp . . .	--	1.525	--	1.525	--
Assistant warehouse foreman - campaign	--	1.465	--	1.465	--
Cement men	--	--	2.03	--	2.03
Operating foremen	--	--	2.03	--	2.03
Ice machine operators	--	--	1.90	--	1.90
Caterpillar tractor operator . . .	--	--	1.79	--	1.79
Fireman (boiler house)	--	--	1.79	--	1.79
Handymen or minor mechanics . . .	--	--	1.79	--	1.79
Beet laboratory foremen	--	--	1.79	--	1.79
Painters	--	--	1.79	--	1.79
Truck mechanic	--	--	1.79	--	1.79

Table Ib. Hourly rates by production workers in 5 selected beet sugar refineries, U. S. A., 1952

Classification	Hourly rate in plant				
	A	B	C	D	F
Battery operators	$1.44	$1.41	$1.64	$1.41	$1.64
Carbonators	1.44	1.41	1.64	1.41	1.64
Centrifugal foremen	1.44	1.41	--	1.41	--
Cooler operators	1.44	1.41	1.64	1.41	1.64
Evaporators	1.44	--	1.64	--	1.64
Factory beet dump foremen	1.44	1.31	1.51	1.31	1.51
Filter foremen	1.44	1.41	1.64	1.41	1.64
Head flumers	1.44	--	1.51	--	1.51
Kiln operators	1.44	--	1.64	--	1.64
Knife setters	1.44	1.41	1.64	1.41	1.64
Sacking station heads	1.44	1.355	--	1.355	--
Sugar stacker heads	1.44	--	1.64	--	1.64
Tare room foremen	1.44	--	1.64	--	1.64
Yard foremen	1.44	--	--	--	--
Assistant crane operators	1.35	--	--	--	--
Beet dump repairmen helpers	1.35	--	--	--	--
Beet flumers	1.35	1.31	1.41	1.31	1.41
Beet washer and trash rolls	1.35	--	--	--	--
Cell dumpers	1.35	1.31	1.51	1.31	1.51
Cell fillers	1.35	1.31	1.51	1.31	1.51
Engine operators	1.35	--	1.64	--	1.64
Factory dump operators	1.35	1.27	1.41	1.27	1.41
Factory dump taremen	1.35	1.27	1.51	1.27	1.51
Factory piler operators	1.35	--	1.51	--	1.51
Filter helpers	1.35	1.24	1.51	1.24	1.51
Generator room helpers	1.35	--	--	--	--
Granulators (double)	1.35	1.31	1.51	1.31	1.51
Knife filers	1.35	1.31	1.51	1.31	1.51
Laboratory benchmen	1.35	--	1.64	--	1.64
Mechanics helpers	1.35	1.355	1.64	1.355	1.64
Oilers	1.35	1.355	1.41	1.355	1.41
Pulp firemen	1.35	--	1.64	--	1.64
Pulp stacker heads	1.35	1.31	1.64	1.31	1.64
Raymond mill men	1.35	--	1.51	--	1.51
Rock and coke men	1.35	1.27	1.41	1.27	1.41

Table Ib. Hourly rates by production workers in 5 selected beet sugar refineries, U. S. A., 1952--Continued

Classification	Hourly rate in plant				
	A	B	C	D	F
Stacking station - sugar	$1.35	--	$1.51	--	$1.51
Stoker tenders	1.35	--	--	--	--
Sulfur station	1.35	$1.31	--	$1.31	--
Sugar cutters	1.35	--	1.64	--	1.64
Sugar melters	1.35	1.31	1.51	1.31	1.51
Sugar truckers and handlers	1.35	--	--	--	--
Tare laboratory benchmen	1.35	--	1.51	--	1.51
Truck drivers - beet	1.35	1.31	1.51	1.31	1.51
Truck mechanics	1.35	--	--	--	--
Vacuum pan helpers	1.35	1.31	1.51	1.31	1.51
Water tenders	1.35	1.31	1.64	1.31	1.64
Kiln men	--	--	1.41	--	1.41
Laundry machines (filter cloths)	--	--	1.41	--	1.41
Pulp press men	--	--	1.41	--	1.41
Pulp separator	--	--	1.41	--	1.41
Salvage men	--	--	1.41	--	1.41
Skip men	--	--	1.41	--	1.41
Tare room helpers	--	--	1.41	--	1.41
Weighers	--	--	1.41	--	1.41
Wet pulp weigher	--	--	1.41	--	1.41
Supply truck driver	--	--	1.51	--	1.51
Coal handlers (coal fired)	--	1.41	--	1.41	--
Wet hopper and car unloading foremen . .	--	1.355	--	1.355	--
Electrical engines and turbines	--	1.355	--	1.355	--
Head beet feeder	--	1.31	--	1.31	--
Filter press foreman (thick and thin). .	--	1.31	--	1.31	--
Kelly filters (Mason City)	--	1.31	--	1.31	--
Centrifugals, white, raw, intermed . . .	--	1.31	--	1.31	--
Pan floor helpers	--	1.31	--	1.31	--
Pan floor helpers and crystalizers . . .	--	1.31	--	1.31	--
Sugar sacking station, weighing, sewing, packaging, powdered sugar	--	1.31	--	1.31	--
Pulp driers, pressmen, weighing, sacking, sewing, trucking, stacking, and loading	--	1.31	--	1.31	--
Pulp drier drum men	--	1.31	--	1.31	--

Table 1b. Hourly rates by production workers in 5 selected beet sugar refineries, U. S. A., 1952--Continued

Classification	Hourly rate in plant				
	A	B	C	D	F
Sugar warehouse, trucking, stacking, and loading	--	$1.31	--	$1.31	--
Storeroom floormen (year—round) . . .	--	1.31	--	1.31	--
Second carbonation, measure tank and carbonation helpers	--	1.31	--	1.31	--
Pan floor helpers	--	1.27	--	1.27	--
Crystalizer men	--	1.27	--	1.27	--
Centrifugals, row	--	1.27	--	1.27	--
Granulators, single	--	1.27	--	1.27	--
Lime Kiln hoist, 2 kilns	--	1.27	--	1.27	--
Unloading beets, cars and truckers, car cleaners	--	1.27	--	1.27	--
Pulp drier coal and cinder men	--	1.27	--	1.27	--
Boilerhouse ash men	--	1.24	--	1.24	--
Beet washers - helpers	--	1.24	--	1.24	--
Beet scales	--	1.24	--	1.24	--
Pulp pit	--	1.24	--	1.24	--
Predefication tanks	--	1.24	--	1.24	--
Carbonation, filtration, pressmen, helpers, tube cleaners	--	1.24	--	1.24	--
Cloth room	--	1.24	--	1.24	--
Laundry	--	1.24	--	1.24	--
Battery pit	$1.27	--	$1.41	--	$1.41
Beet conveyor men	1.27	--	1.41	--	1.41
Beet receivers	1.27	--	1.41	--	1.41
Beet scalers	1.27	1.31	--	1.31	--
Beet washers	1.27	1.31	1.51	1.31	1.51
Beet washer pit	1.27	--	1.41	--	1.41
Bunker men	1.27	--	--	--	--
Cooler helpers	1.27	--	--	--	--
Cooler helpers	1.27	1.355	1.41	1.355	1.41
Crane helpers	1.27	--	--	--	--
Crystalizers	1.27	1.31	1.51	1.31	1.51
Crystalizers helpers	1.27	1.31	--	1.31	--

Table Ib. Hourly rates by production workers in 5 selected beet sugar refineries, U. S. A., 1952--Continued

Classification	Hourly rate in plant				
	A	B	C	D	F
Granulators (single)	$1.27	$1.31	--	$1.31	--
Intake or ditch men	1.27	--	--	--	--
Knife station helpers	1.27	1.27	$1.41	1.27	$1.41
Laundry machines	1.27	--	1.64	--	1.64
Molasses sales	1.27	--	--	--	--
Pulp drier men	1.27	--	1.51	--	1.51
Pulp press men	1.27	1.31	1.51	1.31	1.51
Pulp weigher	1.27	--	1.51	--	1.51
Saccharate mix tanks	1.27	1.31	1.41	1.31	1.41
Sample carriers (laboratory)	1.27	1.24	1.41	1.24	1.41
Slacker men	1.27	--	1.41	--	1.41
Solution tanks	1.27	--	1.41	--	1.41
Students	1.27	--	1.41	--	1.41
Sweepers	1.27	--	1.41	--	1.41
Trash catcher, rolls, or picking table men	1.27	1.24	1.41	1.24	1.41
Truck drivers - yard	1.27	--	1.41	--	1.41
Truck service men	1.27	--	1.41	--	1.41
Warehouse laborers	1.27	--	--	--	--
Yard and factory laborers	1.27	--	1.41	--	1.41
Assistant sugar boilers	--	--	1.64	--	1.64
Sugar checkers	--	--	1.64	--	1.64
Storekeeper	--	--	1.64	--	1.64
Beet laboratory raspman	--	--	1.51	--	1.51
Hydrate and cooler solution	--	--	1.51	--	1.51
Head sweeper	--	1.27	1.51	1.27	1.51
Liquid sugar helper and loader	--	--	1.51	--	1.51
Miscellaneous helpers	--	--	1.51	--	1.51
Oliver dresser	--	--	1.51	--	1.51
Liquid sugar operator	--	--	1.64	--	1.64
Vortex pot operators	--	--	1.51	--	1.51
Assistant storekeeper	--	--	1.41	--	1.41
Bag tenders	--	--	1.41	--	1.41
Car dumpers and switchers	--	--	1.41	--	1.41
Clothes laundry helpers	--	--	1.41	--	1.41
Thin and thick juice filtration	--	1.24	--	1.24	--

Table Ib. Hourly rates by production workers in 5 selected beet sugar refineries, U. S. A., 1952--Continued

Classification	Hourly rate in plant				
	A	B	C	D	F
Lime kiln, rock, coke, slaker, and millmen	--	$1.24	--	$1.24	--
Limerock hoist - 1 kiln	--	1.24	--	1.24	--
Boilerhouse cleaners and helpers . . .	--	1.24	--	1.24	--
Sweepers and janitors	--	1.24	--	1.24	--
River pump	--	1.24	--	1.24	--
Receiving and handling supplies	--	1.24	--	1.24	--
Steffens - Lime and molasses weighers, saccharate mixers, filter helpers . .	--	1.24	--	1.24	--
Cleaning yard helpers	--	1.24	--	1.24	--
Ditch and pond watchmen	--	1.24	--	1.24	--
Sewer screens	--	1.24	--	1.24	--
Pulp drier shovelers, sweepers, cleaners	--	1.24	--	1.24	--
Beet laboratory	--	1.24	--	1.24	--
Transfer men, $C_{12}H_{22}O_{11}$ warehouse . .	--	1.24	--	1.24	--
Handling molasses	--	1.24	--	1.24	--
Pulp and molasses scales	--	1.24	--	1.24	--
Miscellaneous labor	--	1.24	--	1.24	--
Storeroom floormen - campaign	--	1.24	--	1.24	--
Factory yard:					
Dump operators	--	1.24	--	1.24	--
Weighman	--	1.24	--	1.24	--
Taremen	--	1.24	--	1.24	--
Dumpmen	--	1.24	--	1.24	--
Helpers	--	1.24	--	1.24	--
Beet storage	--	1.24	--	1.24	--

Table Ic. Fringe benefits in 5 selected beet sugar refineries, 1/ U. S. A., 1952

Benefits covered	Plant				
	A	B	C	D	F
Parts of establishment covered	(2/)	(3/)	(4/)	(3/)	(4/)
Unionization:					
Extent (percent)	80-100	80-100	80-100	80-100	80-100
Type	Union shop	Union shop	Union shop	Union shop	Union shop
Rate of pay for work during intercampaign and campaign seasons:					
Over 40 hours or 8-hour day	1.5	1.5 and 5/ 2.0	1.5	1.5 and 5/ 2.0	1.5
Sunday	1.5 and 6/ 2.0	1.5 and 6/ 2.0	1.5	1.5 and 6/ 2.0	1.5
Holiday	1.5 and 6/ 2.0	1.5 and 6/ 2.0	1.5	1.5 and 6/ 2.0	1.5
Paid holidays:					
Intercampaign	8	8	8	8	8
Campaign	3	3	3	3	3
Compensation for incomplete days (Minimum hours)	2	Not in agreement	4	Not in agreement	4
Length of continuous service required for a paid vacation of:					
5 days	10-1/2 months	None	160 days	None	160 days
10 days	1 year	1 year	80 percent of year	1 year	80 percent of year
13 days.	15 years	15 years	15 years	15 years	15 years
15 days.	25 years	25 years	25 years	25 years	25 years

See footnotes at end of table.

Table Ic. Fringe benefits in 5 selected beet sugar refineries, 1/ U. S. A., 1952--Continued

Benefits covered	Plant				
	A	B	C	D	F
Parts of establishment covered	(2/)	(3/)	(4/)	(3/)	(4/)
Year-round employee pension plan:					
Retirement age	65	(7/)	65	(7/)	65
Years of continuous service	15-25	(7/)	15-25	(7/)	15-25
Amount paid monthly 8/ .	$60 to over $100	(7/)	$60 to over $100	(7/)	$60 to over $100
Sick and accident leave granted:					
Year-round employee . .	(9/)	5	0	5	10
Nonyear-round employee .	None	5	10/ 5	5	10/ 5
Other provisions	None	(11/)	(11/)	(11/)	(11/)
Shift differential in cents per hour paid to plant workers:					
Second shift	None	None	5	None	5
Third shift	None	None	7	None	7
Workmen's compensation . . .	None	None	Yes	None	Yes
Free service provided . . .	None	(12/)	(13/)	(12/)	(13/)

1/ Plant A is representative of Rocky Mountain area.
Plant B and D are representative of North Central area.
Plant C and F are representative of West Coast area.
In Plant E no fringe benefits data available.

Footnotes continued on next page.

2/ Skilled workers and unskilled workers grades A, B, and C. Grades A, B, C, D, and E refer to particular wage-rate levels. These are determined by collective bargaining.

3/ Skilled and unskilled workers grades A, B, C, D, E, and clerical. Clerical employees whose work is confidential are not included.

4/ Skilled and unskilled workers grades A, B, C, and office. Employees whose work is of a confidential nature and those working in a supervisory capacity are not covered.

5/ Double time for all work over 16 hours.

6/ Intercampaign season, year-round employees with vacation rating.

7/ Information not available.

8/ Amount of pension is determined by total of company pension benefits paid for or purchased by the company plus primary insurance benefits the employee will be entitled to under the Federal Social Security Act. This amount cannot be less than $100 per month for employees having 25 years or more of continuous service. For employees with less than 25 years of continuous service, pensions are reduced by $4 per month for each year less than 25, however, in no case to be less than $60 per month.

9/ Benefits granted, but amount not stated.

10/ Begins with employees second consecutive campaign.

11/ Employee can accumulate up to 30 days.

12/ Welders furnished gloves, jackets, and caps.

13/ Laundry and cleaning for special uniforms. Also safety appliances to welders.

APPENDIX II: DATA COLLECTION

Data and information for this report on the beet sugar industry were collected by field representatives of the Bureau who visited the refineries. The basis for the collection of data was the questionnaire reproduced on page 73.

It was not possible to get usable information from every company for all the questions. In addition to the information received directly from the refineries, supplementary data were obtained from other Government agencies, trade associations, and the unions.

To reduce the length of the questionnaire for reproduction purposes, the space allowed for answering questions had been drastically reduced. Agents are instructed to answer questions as fully as possible, using additional paper when necessary.

In the tabulations of occupations and machines, the horizontal lines have been omitted to allow the tables to be made more compact for inclusion in this report.

UNITED STATES DEPARTMENT OF LABOR
Bureau of Labor Statistics
Washington 25, D. C.

PRODUCTIVITY AND FACTORY PERFORMANCE - BEET SUGAR REFINING

CONFIDENTIAL PRELIMINARY SURVEY SCHEDULE

Parent company ______________________ Address ____________

Plant name ______________________ Address ____________

Names of officials interviewed (cross out co. or plant):

(Co.) (Plant) ______________________ Title ____________

(Co.) (Plant) ______________________ Title ____________

The data submitted on this schedule will be seen only by sworn employees of the Bureau of Labor Statistics. The data will not be released in any form which permits identification with any specific company, without its written permission.

Survey made by ______________________ Date ____________

______________________ ____________

The following survey questions are preliminary and may be changed by the agent performing the survey wherever necessary to conform to available industry or factory information.

PART I - PRODUCTION DATA

1. Enter the following data for a period of at least 4 weeks during the 1951-52 campaign:

   a. Period begins ____________ and ends ____________

   b. Short tons of beets sliced during period ____________

   c. Percent sugar in beets ________ Purity ____________

2. Enter the following data (in POUNDS) for the selected period:

   Sugar Entering Factory:

   a. In beets purchased . . . . ____________
   b. In crowns . . . . ____________

c. Sugar lost outside factory . . . . ____________________
d. Net sugar in beets sliced (a+b-c) . ____________________
e. In additional molasses worked . . . ____________________
f. Other . . . . ____________________
g. Total net sugar entering factory. . ____________________

Granulated Sugar Production:

h. Reported sugar produced . . . . ____________________
i. In process, end of period . . . . . . ____________________
j. In process, beginning of period . . ____________________
k. Total net production (h+i-j). . . . ____________________

Sugar in Molasses:

l. Reported sugar produced . . . . ____________________
m. In process, end of period . . . . . ____________________
n. In process, beginning of period . . ____________________
o. Total net production (l+m-n) . . . . ____________________
p. Total worked in Steffen . . . . ____________________
q. Difference (see e. above) . . . . . . ____________________

Sugar Losses:

r. Battery . . . . ____________________
s. Lime cake . . . . ____________________
t. Steffen filtrate . . . . ____________________
u. Inversion . . . . ____________________
v. Sewer . . . . ____________________
w. Boiler feed . . . . ____________________
x. Total accounted losses (r to w) . . ____________________
y. Unaccounted losses . . . . ____________________
z. Total losses (equals g - k) . . . . ____________________

3. Enter total net production of the following types during the selected period:

a. Hard white granulated sugar* . . . ____________________
b. Powdered sugar. . . . . ____________________
c. Tablet or cube sugar . . . . ____________________
d. Soft or brown sugar . . . . ____________________
e. Liquid sugar . . . . ____________________
f. Other . . . . ____________________
g. Total . . . . ____________________

* Not processed further.

4. Enter total net production of the following types during the selected period:

a. Pulp (prepared) . . . . ________________
b. Molasses - not processed . . . . ________________
- after processing . . . ________________
c. Monosodium glutamate . . . . ________________
d. Other byproducts (specify) . . . . ________________

5. Enter total net production of sugar packed in the following sizes during the selected period:

100 lb. bag	________	2 lb. pkg.	________
25 lb. pkg.	________	1 lb. pkg.	________
10 lb. pkg.	________	Bulk (for delivery)	________
5 lb. pkg.	________	Other	________

PART II - MAN-HOUR DATA

(Man-hours are requested in this part in three major groups:
(1) Production and related worker man-hours expended in processing
(2) Production worker man-hours expended in packing; and
(3) Production worker man-hours expended on related products.)

1. Enter the number of man-hours expended during the selected period in the production of sugar and byproducts reported in Part I.

a. Total factory man-hours ________________
b. Direct factory man-hours ________________
c. Indirect factory man-hours ________________
(Incl. foremen, maintenance, boiler house; excl. research, office, sales, etc.)

2. Enter on the following pages by occupation the number of employees and the number of man-hours expended during the selected period for the production of sugar reported in item 2k of Part I. Insert accounts or occupations not listed below.

(See next page)

Labor account or occupation	Number of employees			Total man-hours (all shifts)	Direct (D) or Indirect (I)
	1	2	3		
Beet End:					
Unloaders					
Flumers					
Trash catchers					
Beet washers					
Weighers					
Cutter men					
Knife filers					
Knife setters					
Cell fillers					
Cell dumpers					
Pulp handlers					
Sulphur burners					
Tank men (for carbonators)					
Carbonators					
Filter pressmen					
Laundry men					
Evaporators					
Tank men (after evaporation)					
Working foremen					
Other					
Sugar End:					
Sugar boilers					
Crystallizer men					
Centrifugal men					
Sugar melters					
Granulators					
Sugar packers (100 lb.) (consumer tablet)					
Bag sewers					
Sugar pilers					
Working foremen					
Other					
Steffens House:					
Molasses weighers					
Cooler men					
Filter pressmen					
Mixers					
Heater men					

Labor account or occupation	Number of employees			Total man-hours (all shifts)	Direct (D) or Indirect (I)
	1	2	3		
Working foremen					
Other					
Boilerhouse:					
Water tenders					
Firemen					
Cleaners					
Coal passers					
Working foremen					
Other					
Lime Kiln:					
Rock breakers					
Rock washers					
Coke men					
Lime shovelers					
Skip men					
Slaker men					
Working foremen					
Other					
Maintenance:					
Engine men					
Oilers					
Electricians					
Machinists					
Blacksmiths					
Pipe fitters					
Carpenters					
Working foremen					
Other					
Laboratory:					
Chemists					
Samplers					
General:					
Elevator men					
Crane men					
Laborers					
Other					
TOTAL					

3. Enter the number of direct production man-hours expended during the selected period in the production of the following products reported in items 3 and 4 of Part I.

   a. Powdered sugar (grinding only) ____________________
   b. Tablet sugar (forming only) ____________________
   c. Liquid sugar (dissolution only) ____________________
   d. Pulp (pressing, drying, heating) ____________________
   e. Monosodium glutamate ____________________
   f. Other byproducts ____________________

4. Enter the number of direct production man-hours expended during the selected period in the packaging or bagging of the sugar reported in item 5 of Part I.

   a. 100 lb. bagging ____________________
   b. Bulk loading ____________________
   c. Consumer size packaging ____________________
   d. Tablet packing ____________________
   e. Other (specify) ____________________

5. Enter indirect man-hours allocated to packing department, if possible to separate. ____________________

6. Describe in detail methods of forming and packing tablet sugar. This is of particular interest abroad. Check relationship of 3b above and 3c of Part I.

PART III - EQUIPMENT DATA

1. Enter the following data for all processing plant equipment, listed in sequence of actual flow of process. Equipment list on following pages is not complete and is to be used only as a guide.

Name of machine	Manufacturer	No. of machines	Capacity	Speed (rpm)	Type of drive	Degree of automaticity	Special features	No. of operators
Receiving:								
Feeder								
Trash catcher								
Washer								
Screen								
Scales								
Slicer								
Other								
Diffusion:								
Purification:								
First carbonation:								
Second carbonation:								
Filters								
Thickeners								
Ion exchange:								
Evaporation:								
Crystallization:								
Melters								
Vacuum pans								
Mingler								
Centrifugals								
Crystallizers								
Other								
Packing:								
Scales								
100 lb. filling machines								
Steffens process:								
Pulp preparation:								

1. Enter the following data for all material handling devices, listed if possible in sequence of use. 1/

Name	Number	Location and Use	Approximate distance served	No. of operators 2/

1/ Include fixed conveyors, chutes, flumes, etc.
2/ Refers to operators exclusively engaged in material handling.

PART IV - PLANT DATA

1. Enter the following employment data for the selected period:

   a. Number of production (direct) workers ______
   b. Number of indirect workers ______
   c. Number of office workers ______
   d. Total plant employment ______

2. Enter the following data on plant buildings:

Name or use	Sq. Ft. by floor 1	2	3	Age	Type of Construction and special features

3. Enter the following data on plant equipment:

   a. Approximate age of equipment in use ______
   b. Describe briefly the addition or replacement of equipment since 1947 which has given better performance.
   c. Approximate time devoted to cleaning or repair of equipment during campaign ______
   d. Describe briefly any equipment of special interest, noting particularly automatic feed, control, etc.

4. Describe the factors which in management's opinion contributed the most to improvements in factory operations during the past 5 years.______________________________

5. Obtain the following wherever possible:

   a. Plant and process layout diagram.
   b. Form used in production control, chemical testing, etc.
   c. Photographs of equipment.

PART V - TESTING

1. List and describe briefly all analytical tests conducted at the factory and laboratory, noting purpose, use, location of test, equipment used, frequency, etc.________________________

2. In the chemist's opinion, what was the relative quality of beets during the selected period and what was the effect of the type of beet on the process at that time?________________________

3. Does the company do research for the improvement of the processing? Describe briefly any changes arising from laboratory research which have increased the output of sugar in the past 5 years.____________

PART VI - NARRATIVE REPORT

1. Indicate briefly method of storing beets and method of beet pile ventilation. ______________________________
2. Indicate briefly method of conveying beets from storage to process.______
2a. Percent of flume water recirculated. ____________
3. Slicing capacity in short tons of beets per 24 hours. __________
3a. What equipment (e.g. vacuum pans) or other factor (e.g. available steam) limits plant to present capacity?______________
3b. How often are beet-slicer knives set, sharpened or changed?____________
3c. Indicate briefly type of scale or control for cossettes entering diffusion battery.____
4. Is an anti-foaming agent used in diffusion?_____________
4a. Is pulp press water used in diffusion? Elsewhere?____________________
5. Is first and second carbonation batch or continuous?_________________
5a. Indicate briefly method and frequency of determining first and second carbonation endpoints._________________________________
6. Indicate types and points of application of filter aid; thickening aid. ____
6a. Indicate time involved and frequency of filter cloth cleaning.__________
6b. Indicate points of application of activated carbon._____________________
7. Indicate type of evaporators used. _________________________________

7a. During reported period, Btu in fuel to boilers per ton of beets sliced; per 100 lb. bag of sugar produced. ______

8. Indicate type of vacuum pans used. ______

9. Are centrifugals fully automatic? ______

9a. Indicate number of centrifugals operated by one man. ______

10. Is packing department operated 24 hours? ______

10a. Describe briefly method of storing packaged or bagged sugar. ______

10b. Describe briefly method of loading sugar delivered in bulk. ______

11. Describe briefly method of obtaining liquid sugar, i.e. point of exit from process or dissolution. ______

12. If ion exchange process of purification is used, indicate number of workers engaged in process and give management's opinion, estimate or actual figures for savings in man-hours and sugar recovery over conventional process. ______

13. Are number of employees and man-hours expended in production of lime and carbon dioxide included in reported man-hours of Part II? If not, indicate both for reported period. ______

14. Are number of employees and man-hours expended in the Steffen process of recovery of sugar from molasses included in reported man-hours of Part II? If not, indicate both for reported period. ______

14a. Same for barium saccarate process. ______

14b. Same for packing dried beet pulp. ______

15. Describe briefly method of disposal of waste water, lime cake and Steffen filtrate. ______

GLOSSARY

Adobe	Earth with a high-clay content.
Beet end	The part of the sugar factory which includes the process through the evaporators. In factories where the vacuum pans are heated by vapors, the evaporators are usually included in the sugar end.
Bone char	Bone coal; bone black; charred and granulated selected bones of cattle. The material functions as an activated absorber for color and ash, and was widely used in beet factories in the last century. In current use in cane sugar refineries. Activated carbon is now used in beet factories.
Bottleneck	Any operation which, because of limitations in the size of equipment, prevents increases in the daily slicing rate.
Brix	A hydrometer scale, calibrated to read percent sugar in pure sugar solutions.
Cake	The solid material separated from sugar sirups or juices by filters.
Campaign	The period of the year during which the refinery makes sugar, generally August to January.
Clarification	The process of removing undissolved materials from a liquid; the removal of solids either by settling or filtration.
Filter aid	Any inert, insoluble material used to improve filtration, generally a type of diatomaceous earth.
Granulator	A drier for sugar crystals; usually of the rotating drum type.
Lime cake	The filter cakes from the first and second carbonation filters, consisting of impure calcium carbonate.
Massecuite	The contents of the vacuum pan after boiling is complete; a mixture of mother liquor and sugar crystals.
Mud	Sludge; the discarded impure calcium carbonate precipitates in first and second carbonation.
Pectin	A group of complex carbohydrate derivatives occuring in sugar beets and other plants; characterized by the presence of galacturonic acid groups.
Polarization	A measure of sugar concentration based on its ability to rotate the plane of polarization of polarized light; the

GLOSSARY CONTINUED

	scale of a saccharimeter is calibrated to read percent of sugar in a pure sugar solution, 100 percent being equivalent to a concentration of 26 grams of pure sugar per 100-ml volume, when a portion is contained in a 200-mm polariscope tube, at a temperature of 20°C.
Purge	: To separate mother liquor from crystals by centrifuging.
Saturation	: The treatment of sugar liquors with gases, either carbon dioxide or sulfur dioxide. First and second saturation describes first and second carbonation. Third saturation describes sulfitation.
Seed	: Small quantities of powdered sugar added to the liquor in a vacuum pan to begin the crystal formation.
Strike	: The massecuite discharged from a vacuum pan.
Sugar end	: The part of the sugar factory which includes the process starting from the thick juice to the final product. In factories where the vacuum pans are heated by vapors, the evaporators are usually included in the sugar end.
Sweetwater	: Filtrate and wash water from the first carbonation vacuum filters. Sweetwater is used in making milk of lime, and saccharate milk.
Vapor	: Steam derived from boiling juices, as differentiated from steam generated in the boiler house.

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BLS Report No. 7

WAGE STRUCTURE

West Coast Sawmilling

1952

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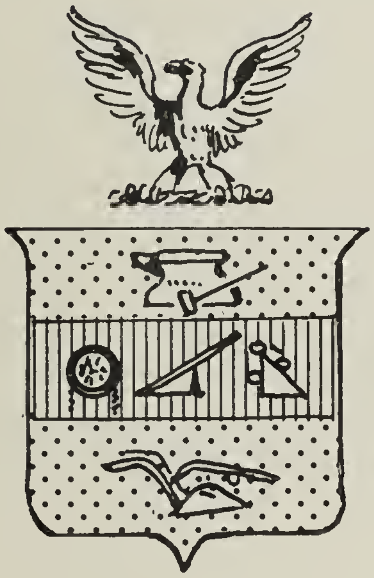

UNITED STATES DEPARTMENT OF LABOR

BUREAU OF LABOR STATISTICS

BLS Report No. 7

WAGE STRUCTURE
West Coast Sawmilling
1952

UNITED STATES DEPARTMENT OF LABOR
Martin P. Durkin - Secretary
BUREAU OF LABOR STATISTICS
Ewan Clague - Commissioner

Washington 25, D. C.
March 1953

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WAGE STRUCTURE OF WEST COAST SAWMILLING [1]

In February 1952 logging camp and sawmill workers averaged $2.01 an hour on a straight-time basis in the Douglas Fir area; in the Western Pine area, the average was $2.04 in the southern district and $1.89 in the northern district. [2] Although individual workers earned from less than $1.50 to more than $4 an hour in each of these large West Coast lumbering areas, a majority had earnings between $1.70 and $2. Hourly earnings of $2 or more, however, were received by 1 of every 3 workers in Western Pine (southern district), 1 of every 4 in Douglas Fir, and 1 of every 5 in Western Pine (northern district).

Logging camp workers, when considered separately, averaged $2.48 in Douglas Fir, and $2.29 in the southern district and $2.17 in the northern district of Western Pine. Individuals earning $2 or more an hour constituted 62 percent of the work force in the first-named area, and 43 and 37 percent in the other two, respectively. Mill workers had lower earnings and averaged $1.89 and $1.92 and $1.79 in the respective areas.

Logging and sawmilling operations on the West Coast are generally recognized as involving fairly distinct differences in production methods according to timber species. The Douglas Fir stands along the Oregon and Washington coasts extend inland to the ridge of the Cascade Mountains. Redwood trees are predominant further south along the northern California coast. The Western Pine species is found eastward from the Cascades and inland through Montana and Idaho, and throughout California, except along the northern coast. This survey relates only to operations in the Douglas Fir and Western Pine areas. Because of particular differences in collective-bargaining procedures in the northern and southern districts of the Western Pine area, the two district groups are considered separately in this report.

Between August 1948, the date of an earlier Bureau survey of West Coast sawmilling, and February 1952, average hourly pay increased 16 percent in Douglas Fir, and 19 percent in the southern district and 20 percent in the northern district of Western Pine. These advances correspond to cents-per-hour increases of 27 in Fir and 32 in both Pine districts. Logging camp workers in all three areas, however, gained more both percentagewise and on a cents-per-hour basis than mill workers.

Occupational Wage Data

Among logging occupations, fallers and buckers using power equipment in cutting and trimming timber, averaged more than $4 an hour in Douglas Fir and the southern district of Western Pine and somewhat less than this amount in the northern Western Pine district. Most workers in falling and bucking crews were paid on the basis of output. In certain other basic logging jobs, including bulldozer operators, cat drivers, ground loaders, head loaders, jammer engineers, and saw filers, workers in all three areas averaged about $2 an hour. Among the lowest paid workers were railroad brakemen and firemen, and chokermen, who earned between $1.75 and $2, on the average.

---

[1] Prepared by John L. Dana of the San Francisco Regional Office of the Bureau's Division of Wages and Industrial Relations.

[2] Based on a mail questionnaire study of independent and integrated sawmills employing 21 or more workers. In the three areas covered, such sawmills numbered about 750 and employed approximately 83,000 workers. Independent or contract loggers were excluded from the survey.

The relationship of area earnings was similar for both sawmilling and logging jobs. Job averages were generally highest for Douglas Fir workers and lowest for those in the northern Western Pine area. The over-all level of earnings was not highest in the Douglas Fir area presumably for two reasons: the proportion of logging workers surveyed in the Douglas Fir area was smaller than in the southern district of Western Pine, and the job average in Douglas Fir ($1.77) for the largest occupational group, green chain sorters, was lower than in the southern district ($2.16). Among the highest paid workers were band-head-saw operators who averaged $2.69 in Douglas Fir, $2.49 in the southern district and $2.46 in the northern district of Western Pine. Other mill hands averaging $2 or more an hour in all three areas were car and truck loaders, air-drying or storage lumber stackers, maintenance machinists, bench-work saw filers, and woodworking machinery set-up men. At the lower end of the scale were machine off-bearers who averaged $1.75 in Douglas Fir, $1.70 in the southern district and $1.64 in the northern district of Western Pine; the respective averages for janitors were $1.72, $1.67, and $1.58 and for watchmen $1.69, $1.60, and $1.52.

The general level of earnings in establishments operating sawmills integrated with logging was higher than in those engaged only in millwork ($2.13 compared with $1.89 in Douglas Fir, $2.04 with $2.01 in southern districts, and $1.97 with $1.78 in the northern district of Western Pine). This relationship was due largely to the higher earnings of logging workers. Rates of pay for specific mill jobs revealed no consistent pattern of variation between independent and integrated operations; the independent mills showed higher job earnings than the integrated mills in the southern district of Western Pine and lower in the northern district.

Neither was there consistency in occupational rate variation according to establishment size in any of the three areas, whether measured by sawmill capacity or total employment. Differences in the occupational averages among various size groups for the lower-paid time-rated jobs frequently amounted to only a few cents an hour. For jobs at the upper end of the wage structure, the differences were slightly greater. In a number of instances this was due to incentive methods of wage payment and in others, it probably was the result of special rates paid to workers in skilled occupations. Among these higher paid jobs, however, there was no definite pattern of variation by establishment size.

The factor influencing to a large degree the similarity of the wage structure in each of the three areas is the multiemployer, master-agreement type of collective bargaining, particularly in Washington and Oregon. In all areas, a substantial majority of the mills had negotiated union agreements.

Although wage structures in West Coast logging camps and sawmills are essentially based on time rates, some few occupations are predominantly incentive-rated. Among these are fallers and buckers in logging camps, car and truck loaders, lumber stackers, and sorters in sawmills. Where intra-area comparisons of job averages for time and incentive workers were possible, the incentive workers earned more in every case.

Hourly pay rates for office workers in the three areas in February 1952 were usually highest in the southern district of Western Pine and lowest in the northern district. Men bookkeepers averaged $2.37 an hour in southern districts of Western Pine, $2.35 in Douglas Fir, and $1.97 in northern districts of Western Pine. Similarly, women employed as general stenographers averaged $1.51, $1.47, and $1.45 in the areas in the same order.

Supplementary Wage Practices

A scheduled workweek of 40 hours for logging and sawmill workers was reported by establishments employing almost 90 percent of the workers in the Douglas Fir area. The proportion of workers on a 40-hour week was somewhat lower in the two Western Pine areas with significant numbers scheduled for longer weeks, most frequently 48 hours.

About a tenth of the production workers in the southern districts of Western Pine were employed on second- or third-shift operations. In the other areas the proportion of extra-shift workers was not as large. All but a few of those on extra shifts received a premium payment, generally amounting to 3 or 4 cents an hour.

Provisions for three paid holidays for nonoffice employees were in force in establishments employing half the production workers in the southern district of Western Pine, 45 percent in Douglas Fir, and 35 percent in the northern district of Western Pine. Almost all other establishments allowed no paid holidays. This reflects largely the nature of the bargaining contract negotiated by the predominant union in each area; one of the two important unions in the industry had contracts stipulating three paid holidays, and the other negotiated a wage increase in lieu of holiday pay.

Vacations with pay for logging and sawmill workers were allowed to the extent of 1 week after 1 year of service for almost all Douglas Fir workers and for substantial majorities in the two Western Pine areas. After 5 years of service, the vacation allowance was extended to 2 weeks for these workers.

The payment of nonproduction bonuses, usually at Christmas time, was made by firms employing about 10 percent of Douglas Fir workers and those employing smaller percentages of workers in the other two areas. A little more than two-fifths of the workers in Douglas Fir and in the northern district of Western Pine were employed in establishments which paid all or part of the premiums on life insurance or health and welfare plans. A slightly smaller proportion of workers in the southern district of Western Pine received similar benefits. Retirement pension plans covered few production workers in this industry.

TABLE 1: Number of establishments and workers in West Coast sawmills and number studied by the Bureau of Labor Statistics, February 1952

Region	Total industry group 1/		Number studied	
	Establishments	Workers	Establishments	Workers
Douglas Fir Area 2/	483	47,458	58	18,720
Western Pine Area:				
Northern district 3/	124	12,555	43	8,862
Southern district 4/	140	22,996	46	15,371

1/ Includes only establishments with 21 or more workers.

2/ Includes the States of Washington and Oregon west of the Cascade Mountains, and the Counties of Del Norte and Humboldt in California.

3/ Includes the State of Washington east of the Cascade Mountains, the States of Idaho and Montana, and the following Counties in Oregon: Baker, Gilliam, Morrow, Sherman, Umatilla, Union, Wallowa, and Wasco.

4/ Includes the Oregon Counties of Crook, Deschutes, Grant, Harsey, Jefferson, Klamath, Lake, Malheur, and Wheeler, and the State of California except the Counties of Del Norte, Humboldt, Mendocino, and Sonoma.

TABLE 2: Number of West Coast sawmills studied, by selected characteristics and area, February 1952

Item	Number of establishments studied in -		
	Douglas Fir area	Western Pine area	
		Northern district	Southern district
Total establishments studied	58	43	46
Unionization			
Union establishments	49	31	36
Nonunion establishments	9	12	10
Size of establishment			
501 or more workers	11	6	10
101 - 500 workers	27	19	24
8 - 100 workers	20	18	12
Capacity of mill (thousand board feet per 8-hour day)			
151,000 or more	15	4	14
81,000 - 150,000	24	11	13
80,000 and under	19	27	19
Not reported	-	1	-
Type of operation			
Independent	32	21	4
Integrated	26	22	42

TABLE 3: Percent distribution of men production workers in West Coast sawmills by average straight-time hourly earnings 1/ and area, February 1952

Average hourly earnings (in cents)	Douglas Fir area	Western Pine area	
		Northern district	Southern district
Under 150	0.2	2.5	0.7
150 and under 155	.2	1.9	.2
155 and under 160	.2	4.0	1.4
160 and under 165	3.5	9.5	3.3
165 and under 170	1.5	17.5	11.4
170 and under 175	13.6	12.4	12.6
175 and under 180	18.0	10.0	9.7
180 and under 185	11.0	8.7	8.2
185 and under 190	10.4	5.1	7.6
190 and under 195	8.2	6.3	7.7
195 and under 200	4.8	3.4	6.0
200 and under 205	4.5	3.0	4.9
205 and under 210	4.0	2.0	4.1
210 and under 215	3.0	1.0	4.2
215 and under 220	2.0	.8	2.4
220 and under 225	1.3	.8	1.6
225 and under 230	1.6	1.4	1.2
230 and under 235	1.2	.6	1.0
235 and under 240	1.2	.8	.8
240 and under 245	.6	.5	.9
245 and under 250	1.0	.2	.9
250 and under 260	1.4	1.2	1.2
260 and under 270	1.1	.8	.7
270 and under 280	1.1	.8	.4
280 and under 290	.2	.6	.6
290 and under 300	.3	.4	.6
300 and under 310	.3	.5	.3
310 and under 320	.2	.9	.4
320 and under 330	.2	.2	.2
330 and under 340	.2	.3	.5
340 and under 350	.2	.5	.4
350 and under 360	.2	.1	.2
360 and under 370	.2	.1	.2
370 and under 380	.1	.1	.1
380 and under 390	.1	(2/)	.1
390 and under 400	.1	.1	.1
400 and over	2.1	1.0	3.1
Total	100.0	100.0	100.0
Number of workers	44,136	11,736	19,997
Average hourly earnings 1/	$2.01	$1.89	$2.04

1/ Excludes premium pay for overtime and late-shift work.
2/ Less than 0.05 percent.

TABLE 4: Percent distribution of men production workers in West Coast sawmills by average straight-time hourly earnings 1/ and type of mill within area, February 1952

Average hourly earnings 1/	Douglas Fir area		Western Pine area			
			Northern district		Southern district	
	Integrated	Independent	Integrated	Independent	Integrated	Independent
Under 150	(2/)	0.4	2.2	3.2	0.8	0.7
150 and under 155	(2/)	.4	.3	5.0	.3	-
155 and under 160	.5	-	.9	10.0	1.5	.2
160 and under 165	3.7	3.3	8.4	11.7	3.5	-
165 and under 170	2.5	.5	16.8	18.6	11.9	1.0
170 and under 175	13.0	14.2	12.3	12.2	12.0	22.9
175 and under 180	13.2	22.6	10.8	8.5	9.5	11.0
180 and under 185	8.1	13.8	9.8	6.5	8.1	9.1
185 and under 190	8.8	11.8	5.6	4.1	7.4	11.3
190 and under 195	7.9	8.4	7.5	3.8	7.8	6.4
195 and under 200	5.8	3.9	4.0	2.2	6.2	3.1
200 and under 205	4.5	4.6	3.4	2.2	4.8	7.1
205 and under 210	4.3	3.7	2.2	1.6	4.0	5.9
210 and under 215	4.1	2.1	1.2	.5	4.2	4.0
215 and under 220	2.5	1.6	.6	1.1	2.4	.7
220 and under 225	1.7	1.0	.6	1.0	1.6	1.7
225 and under 230	1.8	1.4	1.2	1.8	1.2	.2
230 and under 235	1.8	.6	.8	.4	1.1	.4
235 and under 240	1.7	.8	.6	1.3	.8	-
240 and under 245	1.0	.2	.6	.2	1.0	.4
245 and under 250	1.5	.5	.3	.1	.9	1.0
250 and under 260	1.5	1.2	1.2	1.1	1.2	1.0
260 and under 270	1.5	.8	1.0	.4	.6	2.7
270 and under 280	1.4	.8	.5	1.4	.3	2.1
280 and under 290	.3	.2	.9	.2	.5	2.0
290 and under 300	.3	.3	.7	(2/)	.6	.6
300 and under 310	.2	.3	.7	.2	.3	.5
310 and under 320	.2	.1	1.3	(2/)	.4	.7
320 and under 330	.2	.2	.4	-	.2	-
330 and under 340	.4	(2/)	.5	-	.4	1.5
340 and under 350	.4	-	.7	(2/)	.4	-
350 and under 360	.4	-	.1	.1	.3	.4
360 and under 370	.2	.2	.1	.1	.2	-
370 and under 380	.1	(2/)	.2	-	.1	-
380 and under 390	.2	(2/)	.1	-	.1	.2
390 and under 400	.1	(2/)	.1	.1	.1	-
400 and over	4.2	.1	1.4	.4	3.3	1.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	21,220	22,916	7,740	3,996	18,992	1,005
Average hourly earnings 1/	$2.13	$1.89	$1.97	$1.78	$2.04	$2.01

1/ Excludes premium pay for overtime and late-shift work.
2/ Less than 0.05 percent.

TABLE 5: Average straight-time hourly earnings 1/ of men in selected production occupations in West Coast sawmills, by area, February 1952

Occupation	Douglas Fir area		Western Pine area			
			Northern district		Southern district	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Logging						
Blacksmiths, maintenance	14	$2.04	-	-	11	$2.02
Boom men	128	2.19	-	-	-	-
Brakemen, R.R.	89	1.97	6	$1.82	70	1.79
Buckers, hand	248	3.73	-	-	96	3.61
Bulldozer operators	210	2.38	130	2.09	188	2.20
Cat drivers, skidding	277	2.39	210	2.29	410	2.09
Chokermen	954	1.94	291	1.97	683	1.84
Engineers, R.R.	35	2.09	7	1.92	42	1.98
Fallers, power	194	4.28	-	-	59	4.29
Fallers and buckers, power	1,034	4.71	405	3.40	795	4.26
Firemen, R.R.	34	1.84	-	-	41	1.78
Gravel-truck drivers	230	1.92	10	1.80	14	1.97
Ground loaders	303	2.07	165	1.98	360	1.90
Groundmen, rigging	226	2.10	-	-	45	1.90
Head loaders	228	2.30	43	2.22	114	2.23
High riggers	111	2.40	-	-	-	-
Hook tenders, high lead	174	2.56	-	-	37	2.24
Jammer engineers	243	2.33	74	2.25	145	2.26
Log scalers	274	2.27	116	1.73	134	1.96
Mechanics, automotive	294	2.17	209	1.90	306	2.10
Saw filers, cross-cut saws	25	2.35	-	-	11	2.05
Saw filers, power saws	40	2.46	8	2.00	19	2.38
Truck drivers, logging, heavy (over 30,000 lbs.)	555	2.00	185	1.86	521	1.98
Truck drivers, logging, medium (16,000-30,000 lbs.)	159	1.98	68	1.79	189	1.94
Truck drivers, logging, light (under 16,000 lbs.)	-	-	10	1.78	-	-
Sawmilling						
Band-head-saw operators	263	2.69	137	2.46	197	2.49
Blacksmiths, maintenance	63	2.04	23	1.84	31	2.02
Block setters	627	1.92	179	1.89	234	1.99
Carrier drivers	974	1.89	148	1.76	235	1.87
Circular-head-saw operators	355	2.47	28	2.46	-	-
Cut-off-saw operators	464	1.83	90	1.69	128	1.81
Dry-kiln operators	127	2.01	37	1.98	69	1.90
Edgermen	663	2.07	201	1.88	283	1.98
End-lift-truck operators	397	1.86	174	1.72	228	1.86
Firemen, stationary boiler	648	1.82	236	1.72	316	1.80
Graders, lumber (green chain)	555	1.99	87	1.91	224	2.12
Graders, planed lumber	597	2.04	216	1.89	312	2.14
Janitors	750	1.72	161	1.58	336	1.67
Loaders, car and truck	1,492	2.11	385	2.02	435	2.12
Log deckmen	453	1.81	135	1.68	220	1.78
Lumber stackers, air-drying or storage	205	2.58	171	2.34	329	2.92
Lumber stackers, kiln-drying	395	1.99	109	1.98	283	2.22
Machinists, maintenance	283	2.07	47	2.03	115	2.06
Mechanics, automotive	253	2.02	58	1.93	124	2.01
Millwrights	1,004	2.09	163	1.92	376	2.01
Off-bearers, head rig	570	1.81	150	1.67	182	1.77
Off-bearers, machine	542	1.75	205	1.64	443	1.70
Planer operators (feed only)	663	1.82	199	1.72	217	1.79
Planer operators (set-up and operate)	391	2.14	89	1.94	107	2.14
Pondmen	1,315	1.88	283	1.71	330	1.79
Saw filers, bench work	302	2.62	129	2.55	123	2.83
Saw filers, fitters and helpers	185	2.03	66	1.86	84	2.00
Set-up men, woodworking machines	136	2.07	51	2.02	50	2.11
Sorters, green chain	4,129	1.77	492	1.72	729	2.16
Sorters, rough-dry lumber	540	1.81	218	1.75	399	2.02
Tallymen	522	1.85	130	1.74	257	1.82
Trimmermen 2/	866	1.88	164	1.76	250	1.84
1-saw operation (one man)	381	1.83	-	-	-	-
2-or 3-saw operation (one man)	113	1.80	37	1.74	32	1.83
4-10-saw operation (one man)	-	-	45	1.80	64	1.84
4-10-saw operation (trimmerman and 1 helper)	20	1.87	-	-	58	1.84
11-or-more-saw operation (one man)	48	1.98	12	1.73	-	-
11-or-more-saw operation (trimmerman and 1 helper)	182	2.00	-	-	36	1.84
11-or-more-saw operation (trimmerman and 2 helpers)	49	1.97	20	1.79	-	-
Watchmen	1,166	1.69	265	1.52	384	1.60

1/ Excludes premium pay for overtime and late-shift work.
2/ Includes data for types not shown separately.

TABLE 6: Average straight-time hourly earnings 1/ of men in selected production occupations in West Coast sawmills, by type of mill within area, February 1952

Occupation	Douglas Fir area				Western Pine area							
					Northern district				Southern district			
	Integrated sawmills		Independent sawmills		Integrated sawmills		Independent sawmills		Integrated sawmills		Independent sawmills	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Band-head-saw operators	94	$2.70	169	$2.68	78	$2.47	59	$2.45	180	$2.49	17	$2.54
Blacksmiths, maintenance	18	2.05	45	2.04	11	1.91	12	1.78	27	2.01	-	-
Block setters	182	1.93	445	1.91	99	1.91	80	1.88	219	1.99	15	2.08
Carrier drivers	293	1.90	681	1.89	92	1.79	56	1.71	208	1.87	27	1.89
Circular-head-saw operators	61	2.48	294	2.47	10	2.48	18	2.45	-	-	-	-
Cut-off-saw operators	167	1.82	297	1.84	51	1.73	39	1.63	118	1.80	10	1.94
Dry-kiln operators	44	1.94	83	2.04	25	2.03	12	1.86	67	1.88	-	-
Edgermen	200	2.04	463	2.08	99	1.92	102	1.85	268	1.98	15	2.08
End-lift-truck operators	135	1.88	262	1.85	97	1.75	77	1.67	222	1.86	-	-
Firemen, stationary boiler	238	1.82	410	1.82	135	1.73	101	1.70	291	1.80	25	1.84
Graders, lumber (green chain)	210	1.99	345	1.99	58	1.91	29	1.91	201	2.08	23	2.41
Graders, planed lumber	189	2.01	408	2.05	147	1.88	69	1.92	296	2.13	16	2.31
Janitors	342	1.71	408	1.72	105	1.64	56	1.46	304	1.66	32	1.72
Loaders, car and truck	518	2.16	974	2.09	184	2.12	201	1.92	396	2.07	39	2.71
Log deckmen	144	1.79	309	1.82	50	1.71	85	1.66	201	1.78	19	1.84
Lumber stackers, air-drying or storage	101	2.41	104	2.75	67	2.79	104	2.05	309	2.88	-	-
Lumber stackers, kiln-drying	172	2.06	223	1.93	46	2.23	63	1.80	277	2.21	-	-
Machinists, maintenance	155	2.08	128	2.05	31	1.99	16	2.10	115	2.06	-	-
Mechanics, automotive	86	2.06	167	2.00	49	1.93	-	-	122	2.01	-	-
Millwrights	376	2.06	628	2.10	98	1.96	65	1.86	350	2.01	26	1.99
Off-bearers, head rig	143	1.83	427	1.81	71	1.74	79	1.60	167	1.76	15	1.85
Off-bearers, machine	251	1.73	291	1.77	132	1.67	73	1.58	436	1.70	-	-
Planer operators (feed only)	190	1.80	473	1.82	91	1.75	108	1.69	209	1.79	-	-
Planer operators (set-up and operate)	99	2.09	292	2.16	29	2.03	60	1.90	103	2.13	-	-
Pondmen	354	1.86	961	1.89	152	1.74	131	1.68	306	1.78	24	1.81
Saw filers, bench work	89	2.58	213	2.63	63	2.67	66	2.43	110	2.80	13	3.01
Saw filers, fitters and helpers	84	2.00	101	2.06	40	1.90	26	1.81	71	1.96	13	2.19
Set-up men, woodworking machines	58	2.00	78	2.12	36	2.03	15	2.00	50	2.11	-	-
Sorters, green chain	1,402	1.76	2,727	1.78	268	1.77	224	1.66	668	2.16	61	2.15
Sorters, rough-dry lumber	274	1.86	266	1.76	162	1.77	56	1.70	365	2.02	34	1.99
Tallymen	198	1.87	324	1.84	67	1.76	63	1.71	243	1.82	14	1.85
Trimmermen 2/	269	1.85	597	1.90	106	1.78	58	1.73	229	1.83	21	1.87
1-saw operation (one man)	73	1.79	308	1.84	-	-	-	-	-	-	-	-
2-or 3-saw operation (one man)	30	1.72	83	1.83	16	1.79	21	1.70	32	1.83	-	-
4-to 10-saw operation (one man)	-	-	-	-	37	1.82	-	-	59	1.82	-	-
11-or-more-saw operation (one man)	15	1.93	33	2.00	11	1.72	-	-	-	-	-	-
11-or-more-saw operation (trimmerman and 1 helper)	59	1.90	123	2.05	-	-	-	-	36	1.84	-	-
11-or-more-saw operation (trimmerman and 2 helpers)	27	1.91	22	2.05	17	1.79	-	-	-	-	-	-
Watchmen	341	1.70	825	1.69	145	1.60	120	1.43	346	1.58	38	1.71

1/ Excludes premium pay for overtime and late-shift work.
2/ Includes data for types not shown separately.

TABLE 7: Average straight-time hourly earnings 1/ of men in selected production occupations in West Coast sawmills, by capacity of sawmill within area, February 1952

Occupation	Douglas Fir area					
	Capacity of sawmill					
	151 mbf and over		81-150 mbf		80 mbf and less	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Logging						
Buckers, hand	54	$2.89	158	$3.69	-	-
Bulldozer operators	66	2.26	88	2.42	56	$2.47
Cat drivers, skidding	89	2.29	92	2.35	96	2.52
Chokermen	382	1.89	296	1.97	276	1.99
Fallers, power	54	3.70	84	5.11	56	3.59
Fallers and buckers, power	438	3.75	228	4.90	368	5.74
Gravel-truck drivers	70	1.94	132	1.88	28	2.08
Ground loaders	87	1.99	104	2.06	112	2.14
Groundmen, rigging	121	2.00	69	2.13	36	2.38
Head loaders	89	2.31	67	2.31	72	2.28
Jammer engineers	72	2.36	63	2.27	108	2.35
Log scalers	110	2.30	96	2.23	68	2.28
Mechanics, automotive	111	2.09	131	2.19	52	2.30
Truck drivers, logging, heavy (over 30,000 lbs.)	147	2.03	192	2.00	216	1.98
Truck drivers, logging, medium (16,000 - 30,000 lbs.)	47	2.12	40	2.07	72	1.85
Sawmilling						
Band-head-saw operators	79	2.70	102	2.69	82	2.67
Block setters	76	1.95	222	1.91	329	1.91
Carrier drivers	160	1.88	402	1.90	412	1.88
Cut-off-saw operators	93	1.82	46	1.85	325	1.84
Dry-kiln operators	42	1.82	40	2.15	45	2.05
Edgermen	122	1.99	186	2.14	355	2.06
End-lift-truck operators	78	1.86	179	1.88	140	1.82
Firemen, stationary boiler	106	1.81	286	1.85	256	1.78
Graders, lumber (green chain)	128	1.91	222	2.02	205	2.00
Graders, planed lumber	175	1.97	155	2.03	267	2.08
Janitors	282	1.70	289	1.73	179	1.72
Loaders, car and truck	288	2.16	612	2.11	592	2.09
Log deckmen	32	1.81	137	1.82	284	1.81
Lumber stackers, air-drying or storage	32	1.94	93	2.82	80	2.56
Lumber stackers, kiln-drying	114	2.38	94	1.88	187	1.81
Machinists, maintenance	112	2.05	138	2.09	33	2.06
Mechanics, automotive	57	2.02	84	2.06	112	2.00
Millwrights	346	2.04	317	2.11	341	2.12
Off-bearers, head rig	61	1.84	158	1.87	351	1.79
Off-bearers, machine	101	1.73	156	1.79	285	1.74
Planer operators (feed only)	146	1.80	257	1.82	260	1.83
Planer operators (set-up and operate)	43	1.93	104	2.11	244	2.20
Pondmen	212	1.87	534	1.87	569	1.89
Saw filers, bench work	53	2.55	122	2.64	127	2.62
Saw filers, fitters and helpers	76	2.00	97	2.06	12	2.02
Set-up men, woodworking machines	64	1.97	64	2.17	-	-
Sorters, green chain	843	1.76	1,474	1.81	1,812	1.75
Sorters, rough-dry lumber	146	1.94	310	1.77	84	1.74
Tallymen	157	1.88	226	1.87	139	1.81
Trimmermen	148	1.89	257	1.94	461	1.85
Watchmen	132	1.69	392	1.67	642	1.71

See footnote at end of table.

TABLE 7: Average straight-time hourly earnings 1/ of men in selected production occupations in West Coast sawmills, by capacity of sawmill within area, February 1952 - Continued

Occupation	Western Pine area					
	Northern district					
	Capacity of sawmill					
	151 mbf and over		81-150 mbf		80 mbf and less	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Logging						
Buckers, hand	-	-	-	-	-	-
Bulldozer operators	47	$1.97	51	$2.17	32	$2.14
Cat drivers, skidding	80	2.48	44	1.99	86	2.27
Chokermen	78	2.33	84	1.78	129	1.88
Fallers, power	-	-	-	-	-	-
Fallers and buckers, power	42	2.22	127	3.54	236	3.53
Gravel-truck drivers	-	-	-	-	-	-
Ground loaders	42	2.40	61	1.86	62	1.80
Groundmen, rigging	-	-	-	-	-	-
Head loaders	18	2.45	-	-	20	2.00
Jammer engineers	21	2.52	25	2.12	28	2.16
Log scalers	41	1.42	30	1.86	45	1.93
Mechanics, automotive	137	1.85	54	1.97	18	2.08
Truck drivers, logging, heavy (over 30,000 lbs.)	37	1.80	52	1.85	96	1.89
Truck drivers, logging, medium (16,000 - 30,000 lbs.)	10	1.76	16	1.86	42	1.78
Sawmilling						
Band-head-saw operators	15	2.30	31	2.33	91	2.52
Block setters	24	1.93	37	1.88	118	1.89
Carrier drivers	29	1.79	50	1.77	69	1.74
Cut-off-saw operators	10	1.68	23	1.73	57	1.67
Dry-kiln operators	-	-	14	1.90	16	2.14
Edgermen	27	1.88	41	1.89	133	1.88
End-lift-truck operators	17	1.74	47	1.74	110	1.70
Firemen, stationary boiler	13	1.70	52	1.72	171	1.72
Graders, lumber (green chain)	20	1.85	29	1.88	38	1.97
Graders, planed lumber	72	1.82	66	1.86	78	1.99
Janitors	33	1.63	43	1.61	85	1.54
Loaders, car and truck	73	1.74	76	1.80	236	2.17
Log deckmen	-	-	20	1.67	111	1.68
Lumber stackers, air-drying or storage	-	-	32	1.96	133	2.46
Lumber stackers, kiln-drying	31	2.42	42	1.84	36	1.76
Machinists, maintenance	17	2.00	16	2.00	14	2.10
Mechanics, automotive	-	-	23	1.87	28	2.00
Millwrights	40	1.91	37	1.88	86	1.94
Off-bearers, head rig	11	1.71	30	1.74	109	1.64
Off-bearers, machine	67	1.63	49	1.62	89	1.65
Planer operators (feed only)	41	1.68	39	1.75	119	1.72
Planer operators (set-up and operate)	-	-	14	1.91	71	1.96
Pondmen	48	1.74	42	1.72	193	1.70
Saw filers, bench work	14	2.44	17	2.67	98	2.54
Saw filers, fitters and helpers	12	1.84	23	1.95	31	1.81
Set-up men, woodworking machines	17	1.95	17	1.99	17	2.13
Sorters, green chain	21	1.75	149	1.76	322	1.70
Sorters, rough-dry lumber	88	1.70	77	1.80	53	1.78
Tallymen	10	1.76	48	1.75	72	1.72
Trimmermen	16	1.76	33	1.80	115	1.76
Watchmen	40	1.63	49	1.64	176	1.47

See footnote at end of table.

TABLE 7: Average straight-time hourly earnings 1/ of men in selected production occupations in West Coast sawmills, by capacity of sawmill within area, February 1952 - Continued

Occupation	Western Pine area					
	Southern district					
	Capacity of sawmill					
	151 mbf and over		81-150 mbf		80 mbf and less	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Logging						
Buckers, hand	54	$2.28	24	$5.67	18	$4.85
Bulldozer operators	98	2.20	33	2.12	57	2.25
Cat drivers, skidding	142	2.07	82	2.10	186	2.10
Chokermen	276	1.83	124	1.88	283	1.83
Fallers, power	29	2.56	12	5.38	18	6.34
Fallers and buckers, power	319	3.87	198	4.66	278	4.44
Gravel-truck drivers	-	-	-	-	-	-
Ground loaders	158	1.93	98	1.93	104	1.83
Groundmen, rigging	30	1.91	-	-	10	1.94
Head loaders	46	2.26	21	2.15	47	2.24
Jammer engineers	50	2.34	26	2.24	69	2.22
Log scalers	59	1.92	26	1.94	49	2.01
Mechanics, automotive	161	2.07	56	2.08	89	2.15
Truck drivers, logging, heavy (over 30,000 lbs.)	183	2.01	110	2.01	228	1.95
Truck drivers, logging, medium (16,000 - 30,000 lbs.)	23	2.06	41	1.92	125	1.92
Sawmilling						
Band-head-saw operators	68	2.46	45	2.48	84	2.52
Block setters	69	2.01	42	2.02	123	1.97
Carrier drivers	62	1.86	74	1.87	99	1.88
Cut-off-saw operators	38	1.83	29	1.88	61	1.77
Dry-kiln operators	45	1.89	11	1.86	13	1.93
Edgermen	105	1.98	57	2.01	121	1.98
End-lift-truck operators	51	1.85	51	1.89	126	1.86
Firemen, stationary boiler	71	1.84	103	1.80	142	1.78
Graders, lumber (green chain)	58	2.02	67	2.18	99	2.13
Graders, planed lumber	152	2.08	65	2.15	95	2.22
Janitors	132	1.69	100	1.66	104	1.65
Loaders, car and truck	214	1.98	122	2.26	99	2.28
Log deckmen	24	1.90	40	1.79	156	1.77
Lumber stackers, air-drying or storage	37	2.30	131	2.95	161	3.03
Lumber stackers, kiln-drying	167	1.99	67	2.46	49	2.71
Machinists, maintenance	69	2.06	17	2.07	29	2.07
Mechanics, automotive	37	2.02	39	2.04	48	1.98
Millwrights	155	2.03	63	1.98	158	2.01
Off-bearers, head rig	55	1.76	36	1.80	91	1.76
Off-bearers, machine	162	1.70	169	1.69	112	1.70
Planer operators (feed only)	84	1.77	77	1.82	56	1.79
Planer operators (set-up and operate)	42	2.04	14	2.13	51	2.21
Pondmen	94	1.80	108	1.78	128	1.78
Saw filers, bench work	27	2.87	35	2.85	61	2.79
Saw filers, fitters and helpers	34	1.98	25	1.97	25	2.05
Set-up men, woodworking machines	18	2.04	15	2.17	17	2.12
Sorters, green chain	241	2.14	161	2.44	327	2.03
Sorters, rough-dry lumber	167	2.05	101	2.13	131	1.89
Tallymen	90	1.82	63	1.80	104	1.83
Trimmermen	76	1.85	50	1.83	124	1.83
Watchmen	109	1.67	87	1.63	188	1.54

1/ Excludes premium pay for overtime and late-shift work.

TABLE 8: Average straight-time hourly earnings 1/ of men in selected production occupations in West Coast sawmills, by size of establishment within area, February 1952

Occupation	Douglas Fir area					
	Establishments with--					
	501 or more workers		101 - 500 workers		8 - 100 workers	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Logging						
Buckers, hand	134	$3.10	102	$4.08	-	-
Bulldozer operators	70	2.29	92	2.41	48	$2.47
Cat drivers, skidding	115	2.30	102	2.36	60	2.60
Chokermen	450	1.92	312	1.96	192	1.98
Fallers, power	102	4.45	44	4.65	48	3.56
Fallers and buckers, power	466	3.75	280	5.25	288	5.75
Ground loaders	95	1.99	124	2.05	84	2.19
Groundmen, rigging	128	2.01	62	2.12	36	2.38
Head loaders	100	2.30	80	2.28	48	2.34
Hook tenders, high lead	72	2.47	66	2.49	36	2.89
Jammer engineers	79	2.33	92	2.26	72	2.42
Log scalers	124	2.23	102	2.29	48	2.34
Mechanics, automotive	128	2.12	118	2.17	48	2.31
Truck drivers, logging, heavy (over 30,000 lbs.)	147	2.02	192	2.01	216	1.98
Truck drivers, logging, medium (16,000 - 30,000 lbs.)	47	2.12	64	1.98	48	1.85
Sawmilling						
Band-head-saw operators	53	2.72	112	2.67	98	2.70
Blacksmiths, maintenance	13	2.04	38	2.02	12	2.11
Block setters	54	1.94	156	1.94	417	1.90
Carrier drivers	95	1.88	362	1.89	517	1.89
Cut-off-saw operators	89	1.82	54	1.84	321	1.84
Dry-kiln operators	26	1.82	52	1.97	49	2.15
Edgermen	92	1.98	164	2.11	407	2.07
End-lift-truck operators	70	1.84	130	1.90	197	1.83
Firemen, stationary boiler	54	1.80	350	1.82	244	1.81
Graders, lumber (green chain)	109	1.90	176	2.02	270	2.00
Graders, planed lumber	129	1.92	196	2.02	272	2.10
Janitors	215	1.70	292	1.73	243	1.72
Loaders, car and truck	228	2.09	452	2.14	812	2.10
Log deckmen	25	1.82	108	1.82	320	1.80
Lumber stackers, air-drying or storage	37	1.94	84	2.99	84	2.45
Lumber stackers, kiln-drying	86	2.44	234	1.92	75	1.70
Machinists, maintenance	96	2.06	150	2.09	37	2.04
Mechanics, automotive	33	2.02	96	2.04	124	2.01
Millwrights	239	2.04	360	2.05	405	2.15
Off-bearers, head rig	43	1.82	132	1.85	395	1.80
Off-bearers, machine	72	1.73	188	1.76	282	1.75
Planer operators (feed only)	104	1.78	190	1.83	369	1.82
Planer operators (set-up and operate)	29	1.92	102	2.04	260	2.21
Pondmen	136	1.86	418	1.86	761	1.89
Saw filers, bench work	36	2.50	94	2.73	172	2.58
Saw filers, fitters and helpers	49	1.98	112	2.06	24	2.02
Set-up men, woodworking machines	60	1.96	40	2.08	36	2.23
Sorters, green chain	631	1.79	1,346	1.78	2,152	1.77
Sorters, rough-dry lumber	138	1.95	270	1.77	132	1.75
Tallymen	137	1.87	176	1.88	209	1.82
Trimmermen	111	1.88	274	1.90	481	1.87
Watchmen	95	1.68	306	1.72	765	1.69

See footnote at end of table.

TABLE 8: Average straight-time hourly earnings 1/ of men in selected production occupations in West Coast sawmills, by size of establishment within area, February 1952 - Continued

Occupation	Western Pine area					
	Northern district					
	Establishments with -					
	501 or more workers		101 - 500 workers		8 - 100 workers	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Logging						
Buckers, hand	-	-	-	-	-	-
Bulldozer operators	73	$2.04	34	$2.16	23	$2.16
Cat drivers, skidding	96	2.40	42	2.09	72	2.27
Chokermen	117	2.14	66	1.80	108	1.89
Fallers, power	-	-	-	-	-	-
Fallers and buckers, power	111	2.71	90	3.55	204	3.70
Ground loaders	72	2.21	41	1.82	52	1.78
Groundmen, rigging	-	-	-	-	-	-
Head loaders	20	2.47	-	-	17	1.99
Hook tenders, high lead	-	-	-	-	-	-
Jammer engineers	34	2.38	20	2.09	20	2.17
Log scalers	46	1.47	30	1.86	40	1.94
Mechanics, automotive	169	1.85	29	2.06	11	2.13
Truck drivers, logging, heavy (over 30,000 lbs.)	52	1.82	70	1.82	63	1.94
Truck drivers, logging, medium (16,000 - 30,000 lbs.)	15	1.84	15	1.79	38	1.78
Sawmilling						
Band-head-saw operators	24	2.32	33	2.33	80	2.55
Blacksmiths, maintenance	-	-	-	-	11	1.77
Block setters	36	1.92	39	1.86	104	1.90
Carrier drivers	52	1.79	46	1.78	50	1.70
Cut-off-saw operators	19	1.71	19	1.74	52	1.66
Dry-kiln operators	10	1.80	13	1.92	14	2.15
Edgermen	40	1.89	46	1.90	115	1.88
End-lift-truck operators	28	1.75	54	1.74	92	1.69
Firemen, stationary boiler	25	1.71	70	1.72	141	1.71
Graders, lumber (green chain)	26	1.83	31	1.89	30	2.00
Graders, planed lumber	116	1.82	43	1.93	57	2.02
Janitors	48	1.63	42	1.61	71	1.52
Loaders, car and truck	90	1.79	87	1.84	208	2.19
Log deckmen	-	-	29	1.70	100	1.67
Lumber stackers, air-drying or storage	15	1.78	34	2.16	122	2.46
Lumber stackers, kiln-drying	37	2.34	48	1.84	24	1.70
Machinists, maintenance	24	1.99	15	2.01	-	-
Mechanics, automotive	13	1.88	20	1.89	25	1.99
Millwrights	49	1.91	38	1.91	76	1.94
Off-bearers, head rig	20	1.73	31	1.73	99	1.63
Off-bearers, machine	86	1.64	48	1.62	71	1.65
Planer operators (feed only)	54	1.72	39	1.72	106	1.72
Planer operators (set-up and operate)	-	-	13	1.95	68	1.95
Pondmen	64	1.75	50	1.70	169	1.70
Saw filers, bench work	17	2.49	23	2.61	89	2.54
Saw filers, fitters and helpers	21	1.88	24	1.94	21	1.76
Set-up men, woodworking machines	26	1.94	15	2.06	10	2.18
Sorters, green chain	76	1.75	139	1.77	277	1.69
Sorters, rough-dry lumber	108	1.77	70	1.69	40	1.81
Tallymen	30	1.79	38	1.73	62	1.71
Trimmermen	26	1.77	39	1.78	99	1.75
Watchmen	55	1.63	52	1.62	158	1.45

See footnote at end of table.

TABLE 8: Average straight-time hourly earnings 1/ of men in selected production occupations in West Coast sawmills, by size of establishment within area, February 1952 - Continued

Occupation	Western Pine area					
	Southern district					
	Establishments with –					
	501 or more workers		101 – 500 workers		8 – 100 workers	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Logging						
Buckers, hand	14	$2.80	82	$3.75	-	-
Bulldozer operators	80	2.21	78	2.15	30	$2.33
Cat drivers, skidding	111	2.07	179	2.11	120	2.08
Chokermen	218	1.83	275	1.85	190	1.83
Fallers, power	16	2.78	43	4.85	-	-
Fallers and buckers, power	288	3.64	347	4.77	160	4.29
Ground loaders	147	1.92	153	1.93	60	1.79
Groundmen, rigging	29	1.90	-	-	10	1.94
Head loaders	34	2.26	50	2.25	30	2.19
Hook tenders, high lead	-	-	-	-	30	2.20
Jammer engineers	42	2.33	53	2.31	50	2.16
Log scalers	48	1.93	61	2.00	25	1.89
Mechanics, automotive	137	2.06	129	2.08	40	2.27
Truck drivers, logging, heavy (over 30,000 lbs.)	123	2.03	348	1.97	50	1.98
Truck drivers, logging, medium (16,000 - 30,000 lbs.)	23	2.06	41	1.92	125	1.92
Sawmilling						
Band-head-saw operators	56	2.45	89	2.44	52	2.63
Blacksmiths, maintenance	13	2.01	18	2.02	-	-
Block setters	57	2.00	85	2.01	92	1.97
Carrier drivers	49	1.87	161	1.88	25	1.85
Cut-off-saw operators	36	1.82	77	1.84	15	1.66
Dry-kiln operators	30	1.93	39	1.86	-	-
Edgermen	74	1.97	132	1.98	77	2.01
End-lift-truck operators	24	1.82	149	1.87	55	1.87
Firemen, stationary boiler	54	1.83	168	1.80	94	1.78
Graders, lumber (green chain)	47	2.05	100	2.01	77	2.30
Graders, planed lumber	129	2.08	153	2.19	30	2.11
Janitors	106	1.69	178	1.67	52	1.62
Loaders, car and truck	148	2.05	237	2.10	50	2.44
Log deckmen	25	1.87	79	1.78	116	1.77
Lumber stackers, air-drying or storage	38	2.78	201	2.88	90	3.07
Lumber stackers, kiln-drying	161	2.05	122	2.45	-	-
Machinists, maintenance	49	2.04	56	2.08	10	2.13
Mechanics, automotive	37	2.01	57	2.02	30	2.00
Millwrights	116	2.03	186	1.98	74	2.06
Off-bearers, head rig	42	1.76	63	1.78	77	1.76
Off-bearers, machine	148	1.70	230	1.69	65	1.73
Planer operators (feed only)	79	1.76	113	1.81	25	1.77
Planer operators (set-up and operate)	41	2.05	41	2.14	25	2.27
Pondmen	80	1.81	163	1.75	87	1.84
Saw filers, bench work	20	2.95	61	2.82	42	2.77
Saw filers, fitters and helpers	27	1.97	45	2.02	12	1.97
Set-up men, woodworking machines	15	2.05	35	2.13	-	-
Sorters, green chain	178	2.11	340	2.23	211	2.08
Sorters, rough-dry lumber	136	2.06	223	2.07	40	1.63
Tallymen	59	1.83	158	1.81	40	1.84
Trimmermen	63	1.85	110	1.83	77	1.84
Watchmen	93	1.65	180	1.64	111	1.47

1/ Excludes premium pay for overtime and late-shift work.

TABLE 9: **Average straight-time hourly earnings 1/ of men in selected production occupations in West Coast sawmills, by method of wage payment within area, February 1952**

Occupation	Douglas Fir area				Western Pine area							
					Northern district				Southern district			
	Time workers		Incentive workers		Time workers		Incentive workers		Time workers		Incentive workers	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Logging												
Buckers, hand	14	$1.97	234	$3.83	-	-	-	-	-	-	-	-
Fallers and buckers, power	131	2.65	903	5.01	18	$1.98	387	$3.46	-	-	-	-
Sawmilling												
Loaders, car and truck	1,043	1.81	149	2.80	297	1.81	88	2.72	224	$1.73	211	$2.54
Lumber stackers, air-drying or storage	-	-	-	-	123	1.91	48	3.45	108	2.45	221	3.15
Lumber stackers, kiln-drying	319	1.81	76	2.76	61	1.75	48	2.27	154	1.81	129	2.72
Sorters, green chain	-	-	-	-	-	-	-	-	534	2.01	195	2.56
Sorters, rough-dry lumber	-	-	-	-	181	1.69	37	2.06	250	1.75	149	2.48

1/ Excludes premium pay for overtime and late-shift work.

TABLE 10: Average straight-time hourly earnings 1/ of workers in selected office occupations in West Coast sawmills, by area, February 1952

Occupation and sex	Douglas Fir area		Western Pine area			
			Northern district		Southern district	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Men						
Bookkeepers, hand	127	$2.35	15	$1.97	33	$2.37
Clerks, accounting	27	1.85	28	1.83	26	1.89
Clerks, general	36	1.80	56	1.45	26	1.90
Clerks, order	-	-	15	1.91	8	1.79
Clerks, payroll	57	2.08	28	1.71	26	1.82
Women						
Billers, machine (billing machine)	10	1.38	-	-	-	-
Bookkeepers, hand	65	2.18	14	1.69	-	-
Clerks, accounting	88	1.57	-	-	21	1.54
Clerks, general	177	1.48	31	1.25	36	1.75
Clerks, payroll	73	1.74	-	-	29	1.69
Key-punch operators	15	1.32	-	-	-	-
Secretaries	56	1.71	-	-	18	1.83
Stenographers, general	83	1.47	23	1.45	46	1.51
Switchboard operator-receptionists	25	1.31	-	-	13	1.42
Typists, class A	35	1.41	-	-	-	-
Typists, class B	13	1.17	-	-	-	-

1/ Excludes premium pay for overtime and late-shift work.

TABLE 11: Scheduled weekly hours of first-shift workers: Percent distribution of production workers in West Coast sawmills, by area, February 1952

Weekly hours	Percent of production workers in -		
	Douglas Fir area	Western Pine area	
		Northern district	Southern district
40 hours	88.8	73.2	71.9
44 hours	-	2.7	1.2
45 hours	2.4	3.6	4.8
48 hours	6.4	12.0	20.6
50 hours	2.4	5.6	-
54 hours	-	2.9	1.5
Total	100.0	100.0	100.0

TABLE 12: Shift differential practices: Percent distribution of production workers in West Coast sawmills, by area, February 1952

Shift differential	Percent of workers in -		
	Douglas Fir area	Western Pine area	
		Northern district	Southern district
Workers on second shift	6.8	7.1	9.8
Receiving shift differentials	6.8	5.2	9.4
Uniform cents (per hour)	6.8	5.2	9.4
3 cents	1.2	3.0	3.9
4 cents	5.3	2.2	4.8
5 cents	.3	-	.7
Receiving no differential	-	1.9	.4
Workers on third shift	.5	.5	.2
Receiving shift differentials	.5	.5	.2
Uniform cents (per hour)	.5	.5	.2
Under 5 cents	.3	.5	.1
5 cents	-	-	.1
Over 5 cents, under 10	.2	-	-

TABLE 13: Formal provisions for paid vacations: Percent distribution of workers in West Coast sawmills, by area, February 1952

Vacation policy	Percent of production workers in -			Percent of office workers in -		
	Douglas Fir area	Western Pine area		Douglas Fir area	Western Pine area	
		Northern district	Southern district		Northern district	Southern district
Total	100.0	100.0	100.0	100.0	100.0	100.0
1 year's service						
Total workers in sawmills having paid vacations	96.8	83.5	87.7	94.9	94.8	94.7
1 week	95.5	83.5	87.7	41.8	52.2	22.5
Over 1 and under 2 weeks	1.3	-	-	-	-	-
2 weeks	-	-	-	53.1	42.6	72.2
Having no paid vacation	3.2	16.5	12.3	5.1	5.2	5.3
2 years' service						
Total workers in sawmills having paid vacations	96.8	83.5	87.7	94.9	94.8	96.3
1 week	95.5	81.1	83.4	41.8	48.9	22.5
Over 1 and under 2 weeks	1.3	-	4.3	-	-	-
2 weeks	-	2.4	-	53.1	45.9	73.8
Having no paid vacation	3.2	16.5	12.3	5.1	5.2	3.7
3 years' service						
Total workers in sawmills having paid vacations	96.8	83.5	87.7	94.9	94.8	96.3
1 week	95.5	81.1	78.3	38.4	48.9	14.3
Over 1 and under 2 weeks	1.3	-	4.3	-	-	-
2 weeks	-	2.4	5.1	56.5	45.9	82.0
Having no paid vacation	3.2	16.5	12.3	5.1	5.2	3.7
5 years' service						
Total workers in sawmills having paid vacations	96.8	83.5	87.7	94.9	94.8	96.3
1 week	7.0	7.9	4.2	12.3	5.2	2.7
2 weeks	88.5	75.6	83.5	82.6	89.6	93.6
Over 2 weeks	1.3	-	-	-	-	-
Having no paid vacation	3.2	16.5	12.3	5.1	5.2	3.7

TABLE 14: Formal provisions for paid holidays: Percent distribution of workers in West Coast sawmills, by area, February 1952

Number of paid holidays	Percent of workers in -		
	Douglas Fir area	Western Pine area	
		Northern district	Southern district
Production workers			
Total	100.0	100.0	100.0
Workers in sawmills having paid holidays	48.1	34.7	53.7
1 day	-	-	1.4
3 days	45.0	34.7	50.0
6 days	3.1	-	2.3
Having no paid holiday	51.9	65.3	46.3
Office workers			
Total	100.0	100.0	100.0
Workers in sawmills having paid holidays	81.8	93.4	91.4
3 days	9.5	4.6	6.1
4 days	-	2.5	-
5 days	-	-	3.3
6 days	69.8	75.4	82.0
7 days	2.5	10.9	-
Having no paid holiday	18.2	6.6	8.6

TABLE 15: Insurance and pension plans: Percent distribution of workers in West Coast sawmills, by area, February 1952

Type of plan	Percent of workers in -		
	Douglas Fir area	Western Pine area	
		Northern district	Southern district
Production workers			
Total	100.0	100.0	100.0
Workers in sawmills having insurance or pension plans 1/	46.2	42.2	38.8
Life insurance	39.3	28.6	37.3
Retirement pension	-	-	2.1
Hospitalization	9.6	26.4	10.5
Health insurance	34.8	26.9	14.5
Having no insurance or pension plans	53.8	57.8	61.2
Office workers			
Total	100.0	100.0	100.0
Workers in sawmills having insurance or pension plans 1/	46.7	41.0	41.4
Life insurance	38.8	32.0	41.4
Retirement pension	15.1	3.8	8.2
Hospitalization	5.8	21.3	1.6
Health insurance	27.6	15.0	3.7
Having no insurance or pension plans	53.3	59.0	58.6

1/ Unduplicated total.

TABLE 16: Nonproduction bonus plans: Percent distribution of workers in West Coast sawmills, by area, February 1952

Type of bonus	Percent of workers in -		
	Douglas Fir **area**	Western Pine **area**	
		Northern district	Southern district
Production workers			
Total	100.0	100.0	100.0
Workers in sawmills having nonproduction bonus plans	12.3	2.9	5.0
Christmas or year-end	10.5	2.9	3.6
Other	1.8	-	1.4
Having no nonproduction bonus plan	87.7	97.1	95.0
Office workers			
Total	100.0	100.0	100.0
Workers in sawmills having nonproduction bonus plans	41.0	21.3	45.9
Christmas or year-end	37.2	21.3	45.9
Other	3.8	-	-
Having no nonproduction bonus plan	59.0	78.7	54.1

APPENDIX

Scope and Method of Study

Hourly Rates or Earnings

The wages presented consist of hourly rates (straight-time average hourly earnings for piece-rate and other incentive workers), excluding premium overtime and shift differential payments. Incentive earnings and cost-of-living bonuses were included as part of the worker's regular pay, but nonincentive payments, such as Christmas bonuses, were excluded. The hourly earnings of salaried workers were obtained by dividing their straight-time salary by normal rather than by actual hours. 1/

Workers and Occupations Covered by the Study

Wage data were not collected for administrative, executive, and professional employees, although such persons are included in the employment totals reported for the industry in table 1. All production (nonoffice) workers are included in the frequency distribution of workers by average hourly earnings. As used in the study, the term "production workers" refers to working foremen and all nonsupervisory workers (including leadmen and trainees) engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, and shipping; maintenance, repair, janitorial, and watchmen services; and in product development, auxiliary production for the plant's own use (e.g., power plant), record keeping, and other services closely associated with the production operations.

Occupations selected for study were chosen for their numerical importance, bench-mark value in collective bargaining, or their representativeness of the entire rate range in the industry. Inexperienced workers, apprentices, and handicapped workers were not reported in the selected occupations but were included in the data for all production workers.

The terms "occupation" and "job" in this report refer to the occupational classifications used by the Bureau in Industry Wage Studies. 2/

Employment

Except in 1 instance (the information regarding the sample in table 1), the number of workers presented is the estimated employment of all West Coast sawmills located in the 3 largest areas and employing 21 or more workers, rather than employment in the sawmills actually studied. Workers on all shifts are included in the employment data, although the wage rates exclude premium pay for late-shift work.

Vacation Plans

The information on vacations is confined to formal plans. It excludes informal arrangements whereby workers may be given vacations at the discretion of their supervisors.

1/ Average hourly rates or earnings for each occupation or other group of workers were obtained by weighting each rate (or hourly earning) by the number of workers receiving the rate.

2/ Copies of the occupational descriptions used in the survey are available on request.

Insurance and Pension Plans and Nonproduction Bonuses

Employees of establishments providing more than one type of insurance or nonproduction bonus are reported for each type of plan. This is contrary to the procedure used in reporting other wage and related practices in which establishments have been classified according to their predominant practice. Thus, the total percentages of employees in establishments with any such plan or bonus may be smaller than the sum of the entries for each type. Only plans for which employers pay at least part of the cost are included.

Method of Study

Data were collected primarily by mail from sawmill employers who had cooperated in the previous study made in August 1948. In cases where substitutions were necessary, information was secured by Bureau field representatives directly from establishment payroll and other records. In all sawmills, workers were classified by occupation on the basis of the job descriptions referred to previously.

In sampling, larger proportions of major establishments were included to permit presentation of separate data by type of operation, size of establishment, and method of wage payment. The effect of varying proportions in terms of employment was offset by weighting. Thus, each group was given only its appropriate influence in the data.

LS 53-3383

WAGE STRUCTURE BULLETINS

The following Wage Structure Bulletins, issued as part of the Bureau's Wage and Industrial Relations Program, are available upon request, as long as a supply is available.

Aircraft Engines and Parts, 1945 - No. 10
Airframes, 1949 - No. 74
Aluminum Ware, 1947 - No. 63
Automobile Repair Shops, General, 1946 - No. 39
Bakeries, 1945 - No. 22
Blouses and Waists, Women's and Misses', 1947 - No. 50
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Chemicals, Industrial, 1946 - No. 25
Chemicals, Industrial, 1951 - No. 87
Cigarettes, Chewing and Smoking Tobacco, and Snuff, 1946 - No. 28
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Lumber in the South, 1949-50 - No. 76
Machinery, 1945 - No. 1
Machinery, 1946 - No. 51
Machine Tools, 1945 - No. 3
Machine-Tool Accessories, 1945 - No. 2
Meat Products (except Big Four), 1947 - No. 59
Office Workers, Metalworking, 1945 - No. 13
Paints and Varnishes, 1946 - No. 38
Paperboard Containers and Boxes, 1945 - No. 33
Perfumes and Cosmetics, 1946 - No. 43
Petroleum Refining, 1948 - No. 71
Petroleum Production and Refining, 1951 - No. 83
Power Boilers, 1945 - No. 11
Pulp, Paper, and Paperboard, 1945 - No. 34
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Tanks, Military, 1945 - No. 17
Textile Dyeing and Finishing, 1946 - No. 44
Textiles, Cotton, 1946 - No. 37
Textiles, Cotton and Synthetic, 1952 - No. 89
Textiles, Rayon and Silk, 1946 - No. 41
Textiles, Woolen and Worsted, 1946 - No. 40
Textiles, Woolen and Worsted, 1952 - No. 90
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* A Wage Structure Bulletin (Bulletin No. 1015) for the Motor Vehicles and Parts Industry is available for sale (price 20¢) by the Superintendent of Documents, U. S. Government Printing Office.

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Case study data on
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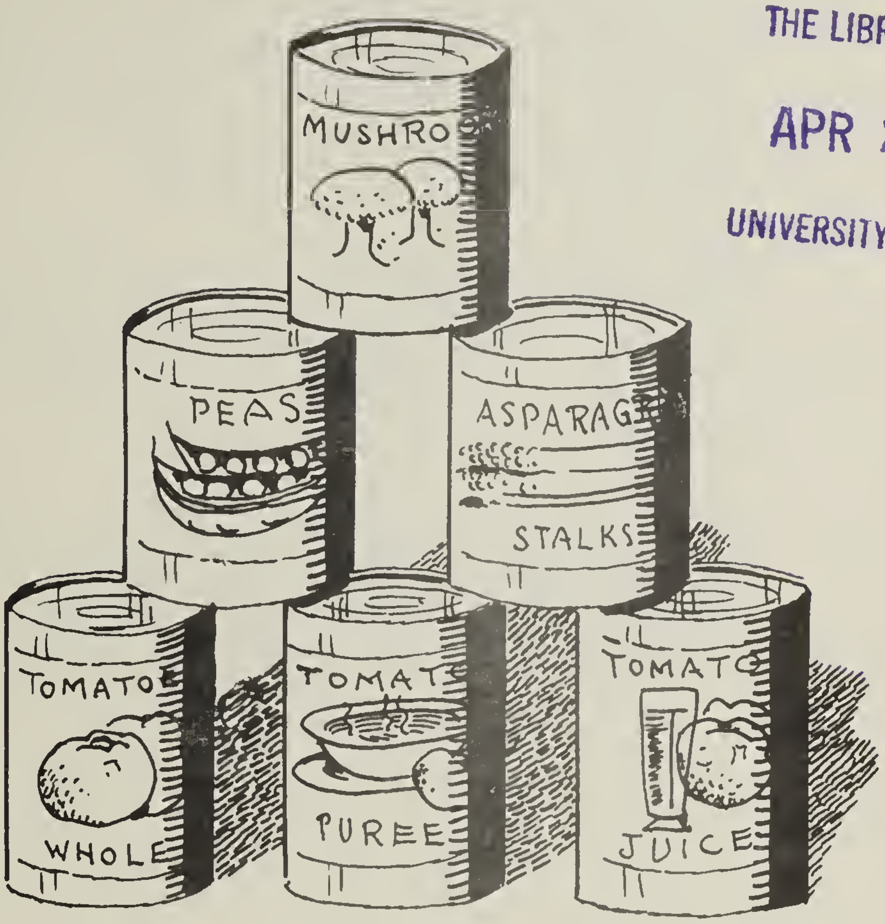
PROCESSED FOODS:
CANNED VEGETABLES



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Productivity and Technical Assistance Division

BY THE UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

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Case Study Data on
Productivity and Factory Performance

PROCESSED FOODS: CANNED VEGETABLES

Page 12. First sentence following Washing should read: Washing is one of the most important though not always the first operation in the canning process.

Page 17. Caption for Fig. H should read: Sealing machine. Workman is placing a carton of can tops in machine.

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ROCESSED FOODS: CANNED VEGETABLES

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2 vegetable processing plants)

Prepared for

Mutual Security Agency
Productivity and Technical Assistance Division

by

United States Department of Labor
Bureau of Labor Statistics

February 1953
Washington 25, D. C.

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no. 8

Case Study Data on
Productivity and Factory Performance

PROCESSED FOODS: CANNED VEGETABLES

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FOREWORD

The primary objective of this report is that it be of use to production managers, superintendents, and methods engineers who are concerned with production problems. It is further hoped that the general discussion of productivity and the presentation of total man-hours per unit in the processing of vegetables will be of interest to government, labor, and trade-association officials. By examining this report plant officials will be able to compare manufacturing operations in their plants with the operations of other plants in this study. In using this report the following procedure is suggested to production officials:

1. Plant officials should refer to tables A, B, and C in chapter I, to identify the United States plants in this study which process the same vegetables as they do in their own plants. For a breakdown of the manufacturing process into machinery and man-hours see tables in chapters I and II, and the text in chapter II.

2. The appendix contains a reproduction of the questionnaire used to obtain the information from the United States plants in this study. If the European production official uses these questionnaires to calculate labor requirements for similar operations or groups of operations in his plant, he will be able to compare performance in his plant with performance in the plants discussed in this report, and isolate areas where his plant's performance is relatively good or relatively poor.

3. The European plant official is now ready to compare American machinery and methods as described in the report with those existing in his own plant, for those problem areas he has isolated. At this point the report does not give him the precise engineering information he may need but it does tell those familiar with the industry the approximate requirements in terms of volume, methods, machinery, and manpower for approaching the productivity levels illustrated in the individual case studies.

4. For serious problem areas uncovered in this manner, the expert assistance of engineers, either those within his plant or outside consultants, will be needed. For this step, intensive study must generally be made in order to correct the conditions found by comparison because these reports do not replace on-the-spot engineers or other specialists in the analysis of specific situations.

In summary, this report may be likened to a series of gages or meters similar in purpose to those which report river levels, pressure in a steam boiler, or a child's temperature. Unlike such meters, which cannot reveal the factors behind the readings, these factory performance studies reveal causes as well as symptoms by giving facts about the technological environment existing at the factories where data were collected. These facts, when acquired by a technician familiar with the industry, can be of material assistance in efforts to correct the conditions indicated by the meter's reading.

Case Study Data on
Productivity and Factory Performance

PROCESSED FOODS: CANNED VEGETABLES 1/

CHAPTER I: GENERAL REPORT

High Lights

The relatively high productivity in the canned vegetable industry in the United States is due primarily to the extensive use of labor-saving machinery and equipment. In the best equipped canneries (and these are not necessarily the large ones) there is a minimum of hand labor. Where feasible, the vegetable is both prepared and filled into cans by machinery. Automatic closing machines seal the lids on the cans. During thermal processing, the pressure and temperature are controlled by automatic devices. Cans are labeled, cased, and sealed by automatic and semiautomatic machines.

Increased productivity has also been attained through the use of materials-handling devices. The raw materials are transported from one operation to another by roller and belt conveyors, hand trucks, and water flumes. Cartons of canned vegetables are moved to storage by mechanical lift trucks and by gravity or powered conveyors. In some canneries, the cases are stacked in the warehouse by portable case stackers.

Commercial canning began in the United States during the period 1819 to 1821. The early canners employed Appert's process of sealing the food in wide-mouthed glass containers and immersing the containers in boiling water. From these modest beginnings, the canning industry has grown during the past 130 years to a highly scientific industry employing principles of bacteriology, engineering techniques, and mathematically determined standards of temperature, pressure, and processing time to insure the highest standards of safety and quality in canned foods.

In the United States, vegetable processing and can manufacture are distinct industries. Canners buy their cans from can manufacturers who offer a wide variety of sizes and shapes.

In addition to supplying cans to processors of canned foods, can manufacturers render other important services to canners. They sell or rent can closing machines and offer a continuous service of maintenance, repair, and replacement of parts to the canners. Free training programs are set up during the slack season to teach cannery technicians the operation and maintenance of particular closing machines. Laboratories are maintained to provide technical advice to canners on canning problems. This service also is free. In ad-

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1/ Prepared by E. L. Herbert, Division of Productivity and Technological Developments, Bureau of Labor Statistics, U. S. Department of Labor.

dition, the can manufacturers maintain an agricultural section whose agronomists go into the field and advise growers on such problems as planting, fertilizing, spraying, and harvesting.

The highly seasonal fruit and vegetable canning industry does not maintain a large permanent work force. When the canning season gets under way most canners recruit a work force to supplement the small permanent force. In many areas housewives and students constitute a large portion of this seasonal work force. Other sources of labor supply include migrants who follow the harvests, and persons employed in other seasonal occupations. A large number of women are employed in the canning industry.

PLANT AND PRODUCT CHARACTERISTICS

This report presents factory performance data from 12 canneries that process mushrooms, peas, asparagus, whole tomatoes, tomato juice, and tomato puree. Each cannery has been assigned an alphabetical designation. For canneries reporting on more than one product a numerical designation was affixed to the alphabetical designation. Thus, cannery K reported data on peas, tomato juice, and tomato puree, and these products are represented by K-1, K-2, and K-3 respectively.

Plants

With the exception of plants A, C, and D, all the canneries in this survey are multiproduct plants. Some process only seasonal vegetables, and when the vegetable growing season ends they suspend operations until the next canning season. Other plants extend the length of their canning operations by the addition of nonseasonal products.

In the intervals between canning seasons, a small work force is employed to service the machinery and equipment for the next year's operations. Partly because of this maintenance, the extent and frequency of interruptions to production during the canning season is negligible. When breakdowns are experienced, they are usually minor and repairs may be made in normal "down time."

The canneries cooperating in this study have excellent plant layouts. Generally, some of the layouts are arranged to permit the vegetables to be either flumed or mechanically conveyed directly from the trucks at the receiving platform to the first processing operation, with machines set up in a line leading directly to the closing machine. The closing machine is placed close to the retorts to minimize the distance the loaded retort crates must be transported for loading into the retorts.

Some of the canneries do not label the product during the canning season. After the product has been thermal processed and cooled the unlabeled cans are cased in unsealed cartons and stored in the warehouse. At the end of the packing season the cans are taken from storage, labels are applied, and the cans are repacked and sealed. Certain canneries sell their products to brokers who usually supply their own labels which are placed on the cans by the cannery.

Products

Canned whole and button mushrooms are prepared from cultivated

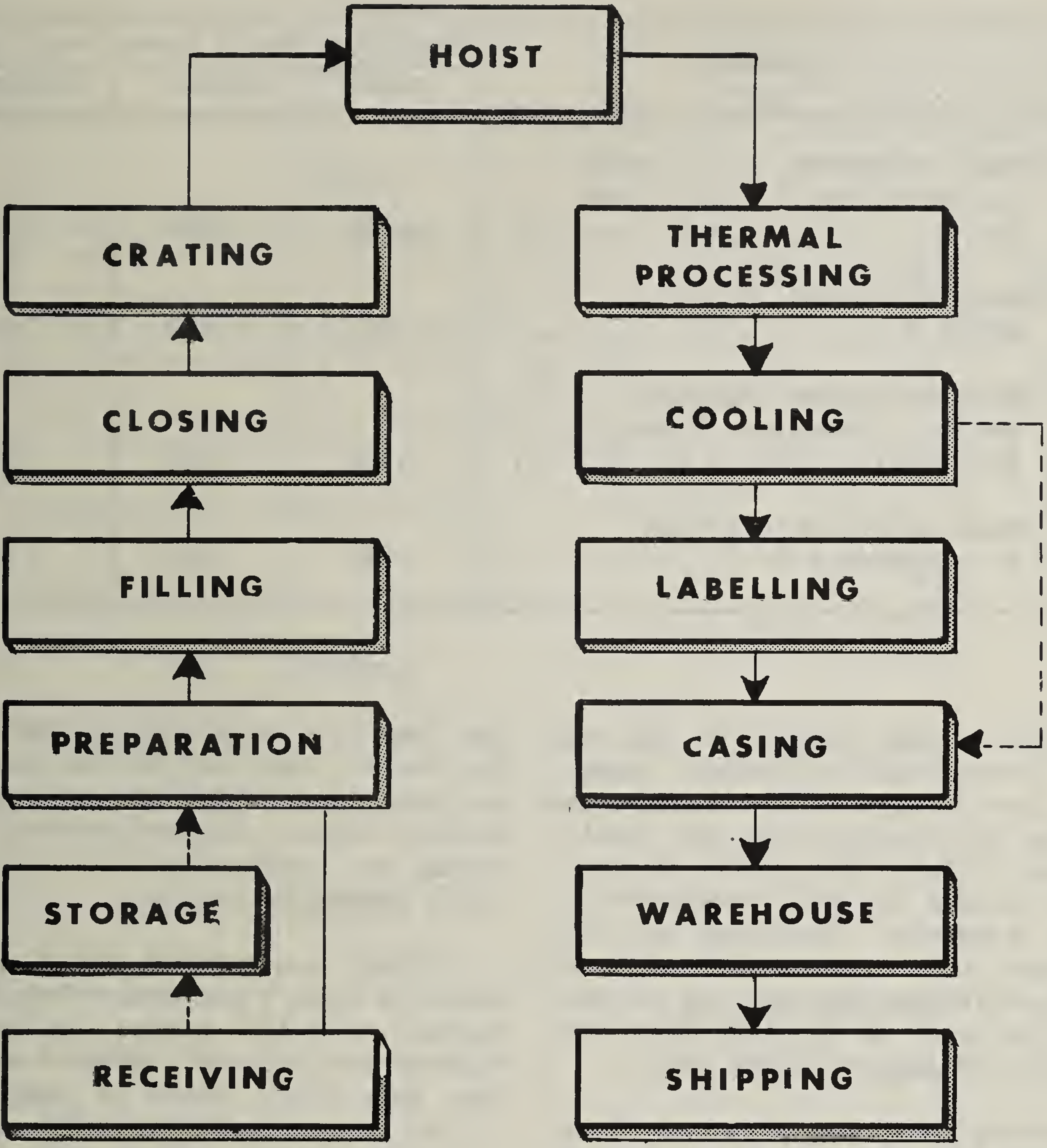


Fig. A Basic flow of work in processing canned vegetables.

Table A. Man-hour requirements in 4 selected mushroom processing plants, U. S. A., 1951

Plant	Product	Man-hours per 1 dozen 4-oz. cans		
		Total	Direct	Indirect
A	Whole mushrooms, U. S. grade A., sizes No. 1, No. 2, and No. 3	0.288	0.280	0.008
B	Whole mushrooms, U. S. grade C	.202	.190	.012
C	Whole mushrooms (buttons) U. S. grade A, sizes No. 2 and No. 3	.366	.342	.024
D	Whole mushrooms (buttons) U. S. grade A	.325	.308	.017

mushrooms. They consist of the cap and a portion of the stem. Mushrooms are termed whole mushrooms when any part or all of the "veil" is open. When the veil is completely closed the whole mushroom is called a button. The stems of the mushrooms are cut transversely so that the distance from the top of the cap to the end of the stem does not exceed the diameter of the cap.

Canned peas are prepared from shelled succulent peas of the Alaska or other smooth skin varieties, or from sweet, wrinkled varieties to which water containing salt or sugar is added.

Canned asparagus is prepared from the edible portions of asparagus plant sprouts. Asparagus is canned as stalks or spears, tips, points, cut stalks or cut spears, and as bottom cuts or cut-tips removed. Stalks or spears consist of the head and adjoining portions of the stalks. They are packed parallel as closely together as practicable without injury to the product. The stalks or spears are not less than 3-3/4 inches in length.

Tips are packed in the same manner as spears and range from 2-3/4 inches to 3-3/4 inches in length. Points are tops of spears and are less than 2-3/4 inches in length.

Cut stalks or cut spears are those which have been cut into pieces without removal of heads or addition of bottom cuts. If cut in lengths of 1-1/4 inches or less, the product usually contains not less than 25 percent by count of heads. If cut in pieces longer than 1-1/4 inches the product usually contains not less than 33-1/3 percent by count of heads. Bottom cuts (or cut-tips removed) are edible spears with heads removed and cut into pieces.

Table B. Man-hour requirements in 8 selected vegetable processing plants, U. S. A., 1951

Plant	Product 1/	Man-hours per dozen cans		
		Total	Direct	Indirect
	PEAS			
H	Sweet peas; U. S. grades A, B, C; sieve sizes 1 to 6; No. 303 can . . .	0.084	0.066	0.018
I	Early June peas; U. S. grades A, B, C; sieve sizes 1 to 6; No. 303 can .	.094	.081	.013
J	Early June peas; U. S. grades A, B, C; sieve sizes 1 to 5; No. 303 can .	.092	.077	.015
K-1	Alaska peas, sieve size 1, No. 303 can	.146	.115	.020
L-1	Peas, U. S. grade C, No. 303 can . . .	.336	.275	.061
	ASPARAGUS			
O	Asparagus, Fancy Cut, 8Z tall can . .	.139	.126	.013
S	Asparagus, Cut Spear, U. S. grade C No. 2 can	.369	.335	.033
	TOMATOES			
L-2	Whole tomatoes, U. S. grade B, No. 2 can	.372	.311	.061
K-2	Tomato juice, No. 2 can	.060	.047	.013
L-3	Tomato juice, U. S. grade A, No. 3 cylinder	.376	.289	.087
K-3	Tomato puree, medium concentration No. 10 can	.552	.472	.080
W	Tomato puree, U. S. grade A, No. 10 can	.579	.506	.073

1/ For explanation of can sizes, see table Ih, p.69.

Table C. Employment in the entire plant during the reported period for 12 selected canneries, U. S. A., 1951

Plant	Number of employees (range) [1]			
	Total	Direct	Indirect	Office employees
A	151-175	151-175	1-10	1-10
B	276-300	226-250	21-30	31-40
C	126-150	126-150	1-10	1-10
D	151-175	151-175	1-10	1-10
H	151-175	101-125	31-40	1-10
I	201-225	151-175	31-40	11-20
J	[2]51-75	26-50	1-10	1-10
K-1	451-475	351-375	101-110	11-20
K-2,3	551-575	451-475	91-100	11-20
L-1	51-75	51-75	1-10	1-10
L-2,3	126-150	101-125	21-30	1-10
O	51-75	51-75	1-10	1-10
S	76-100	76-100	1-10	1-10
W	26-50	26-50	1-10	1-10

[1] Exact number of employees not given to avoid disclosure of cannery

[2] Does not include approximately 70 additional employees who work in the field assisting growers, harvesting, vining, and driving trucks.

Tomato juice is the unconcentrated liquid extracted from mature tomatoes of red or reddish varieties. These tomatoes may or may not be scalded, which procedure is followed by draining. In the extraction of such liquid, heat may be applied by any method which does not add water. This liquid is strained free from skins, seeds, and other coarse or hard substances, but carries finely divided insoluble solids from the flesh of the tomato. Such liquid may be homogenized and seasoned with salt.

Tomato puree, or tomato pulp, is prepared from one or a combination of any of the following optional ingredients: (1) the liquid obtained from mature tomatoes of red or reddish varieties; (2) the liquid from the residue of such tomatoes after preparing for canning; and (3) the liquid from the residue after partial extraction of juice from such tomatoes.

Such liquid is obtained by so straining such tomatoes or residue, with or without heating, as to exclude skins, seeds, and other coarse or hard substances. It is concentrated, and may be seasoned with salt. It contains not less than 8.37 percent, but less than 25 percent, of salt-free tomato solids.

Canned tomatoes are mature tomatoes of red or reddish varieties

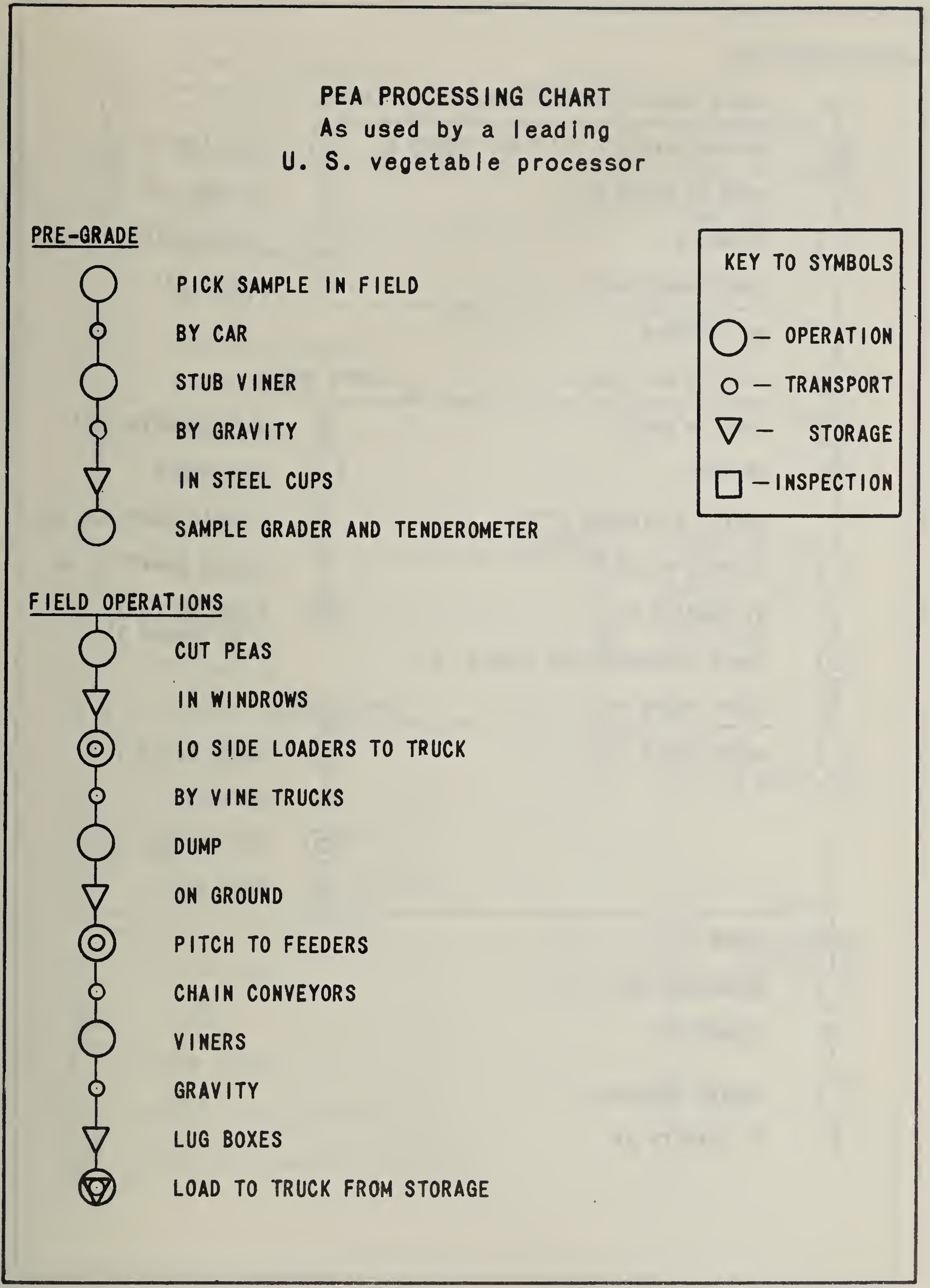
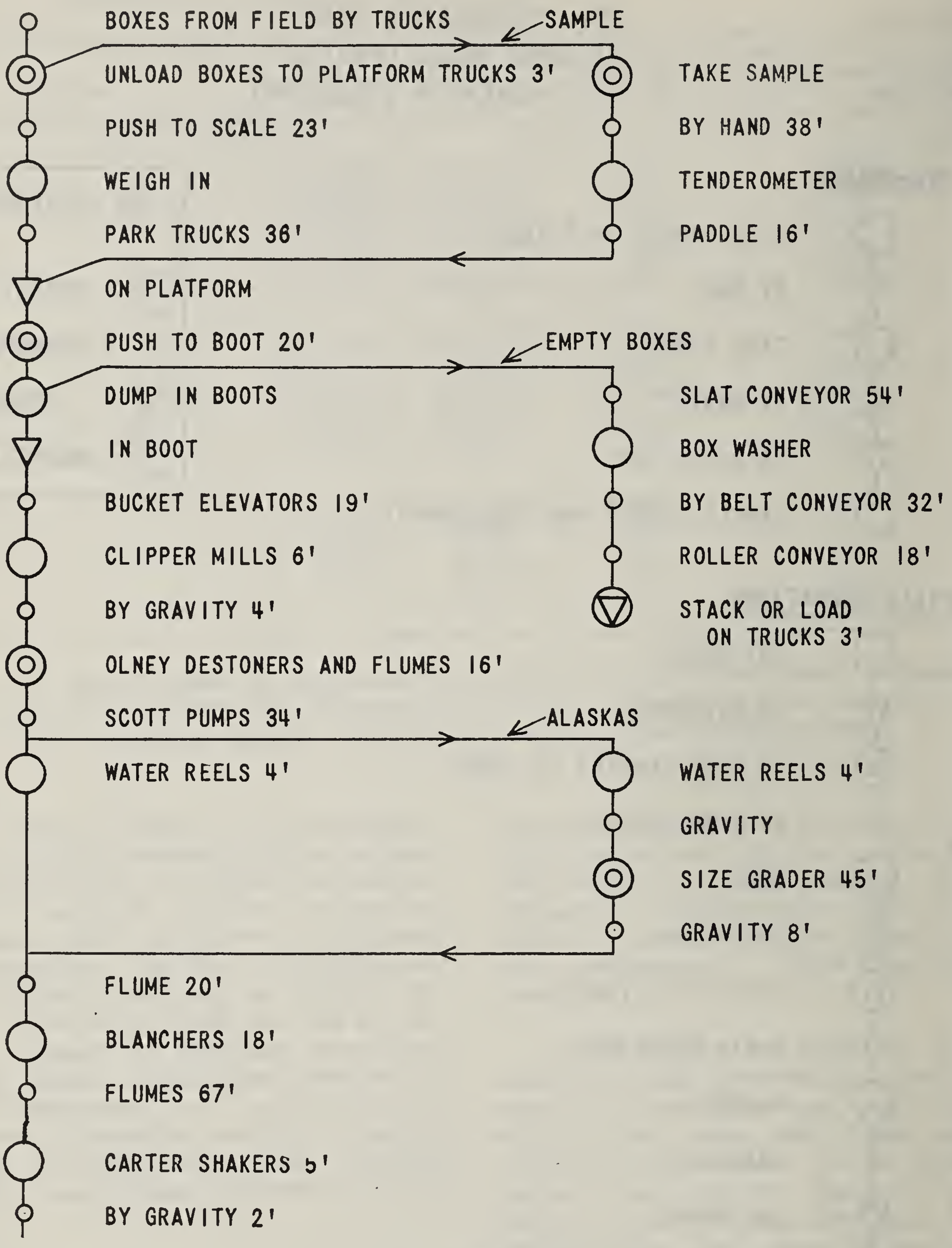
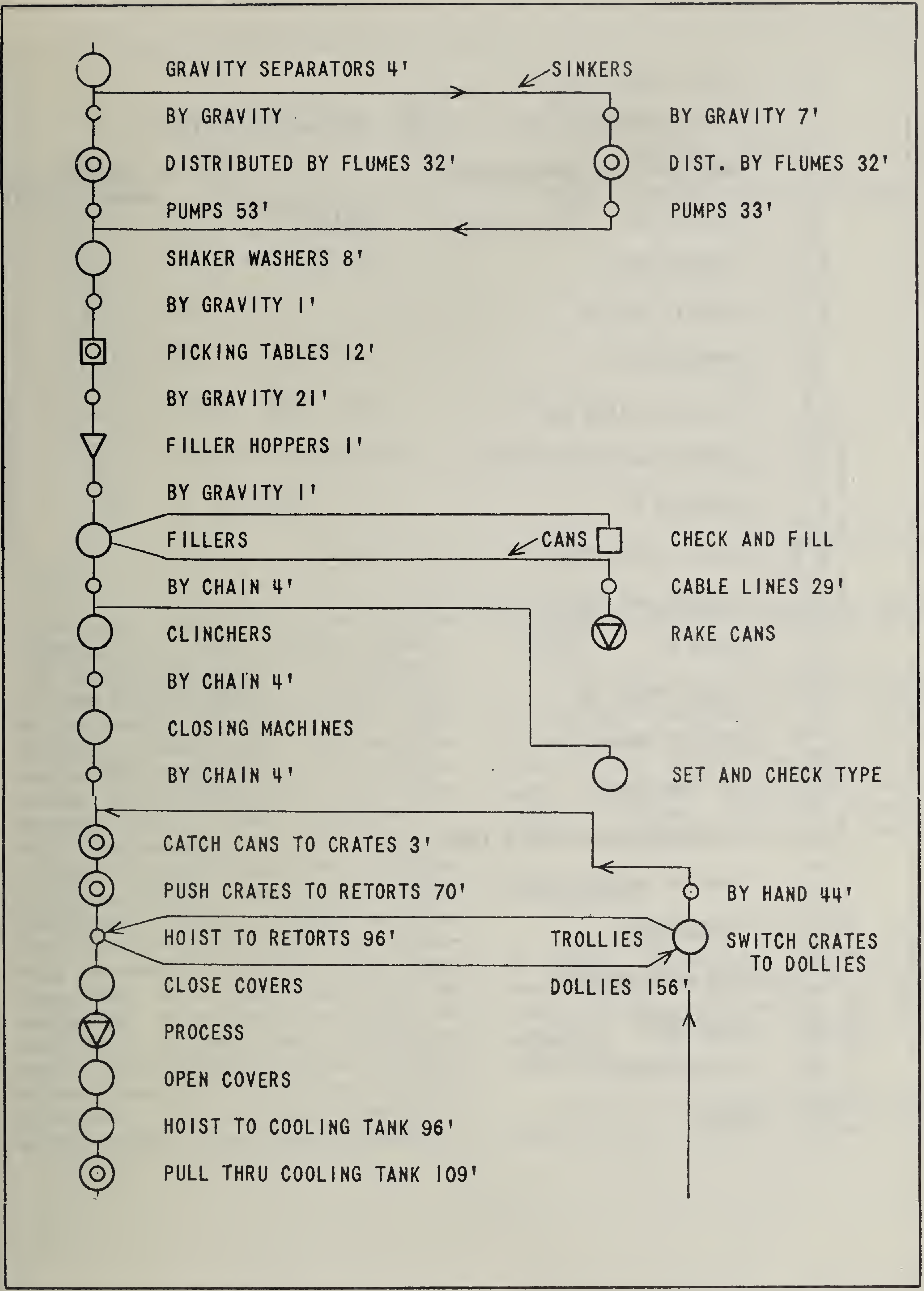
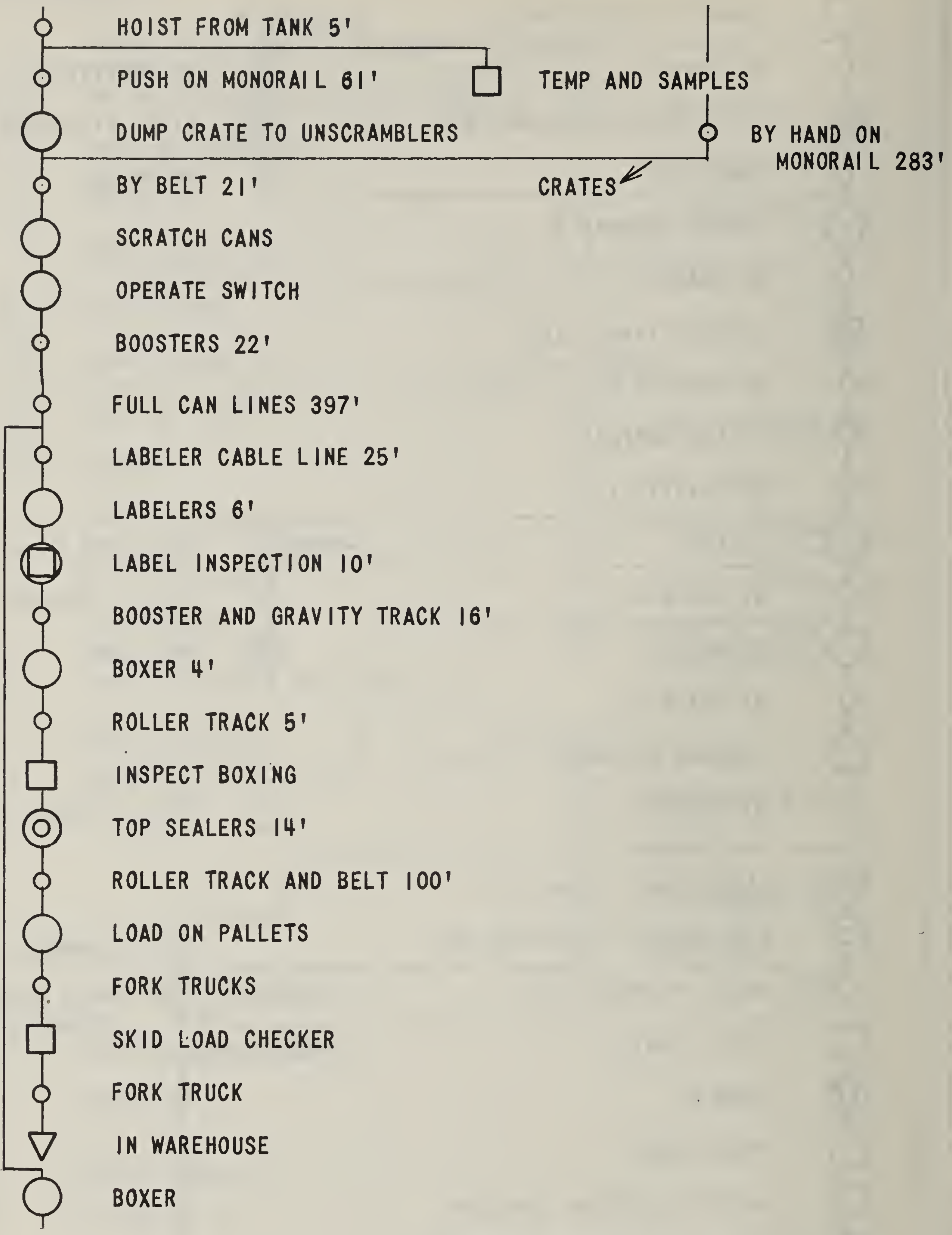


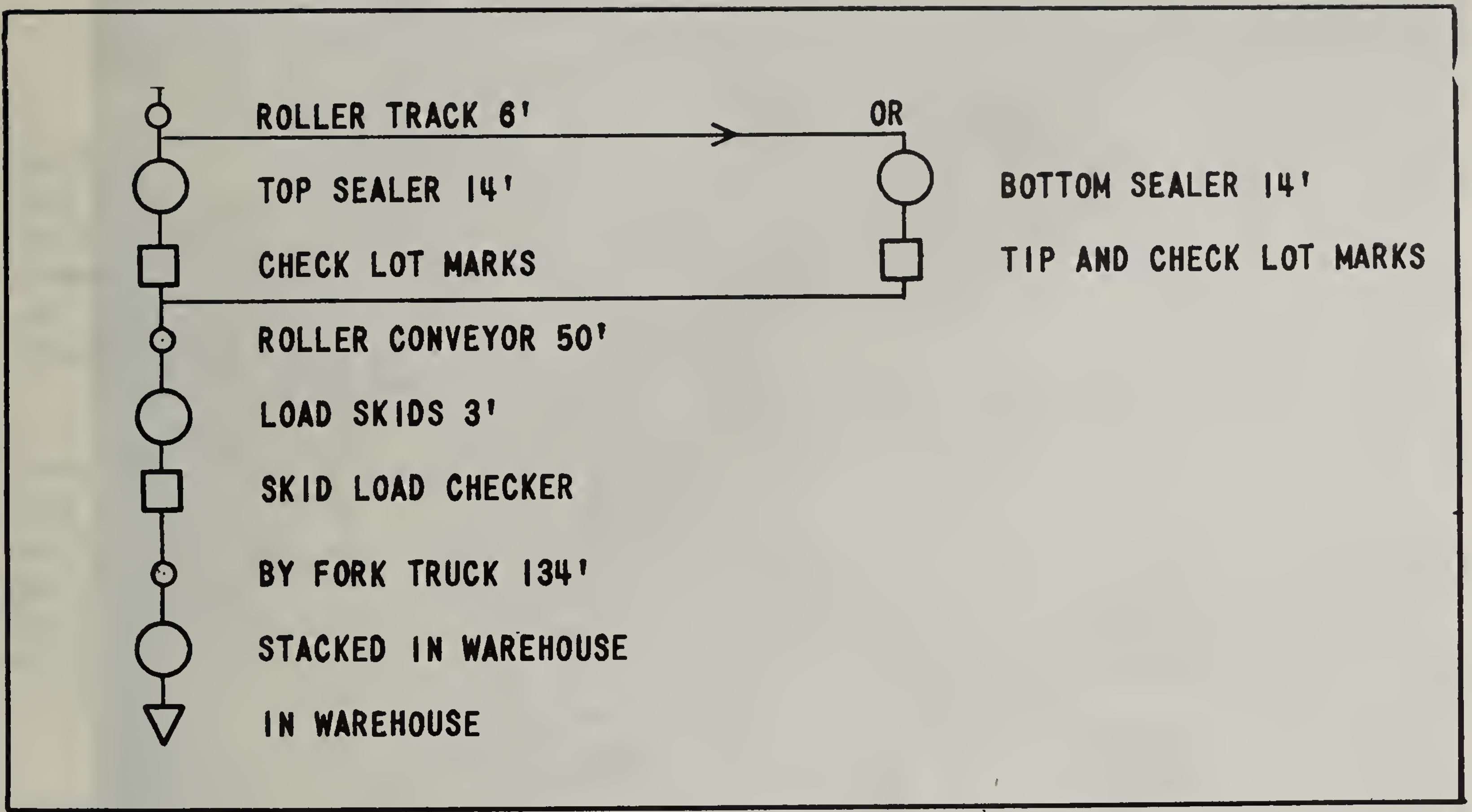
Fig. B Typical flow of work for processing peas.

PLANT OPERATIONS




GRAVITY SEPARATORS 4'
SINKERS
BY GRAVITY
BY GRAVITY 7'
DISTRIBUTED BY FLUMES 32'
DIST. BY FLUMES 32'
PUMPS 53'
PUMPS 33'
SHAKER WASHERS 8'
BY GRAVITY 1'
PICKING TABLES 12'
BY GRAVITY 21'
FILLER HOPPERS 1'
BY GRAVITY 1'
FILLERS
CANS
CHECK AND FILL
BY CHAIN 4'
CABLE LINES 29'
CLINCHERS
RAKE CANS
BY CHAIN 4'
CLOSING MACHINES
BY CHAIN 4'
SET AND CHECK TYPE
CATCH CANS TO CRATES 3'
PUSH CRATES TO RETORTS 70'
BY HAND 44'
HOIST TO RETORTS 96'
TROLLIES
SWITCH CRATES TO DOLLIES
CLOSE COVERS
DOLLIES 156'
PROCESS
OPEN COVERS
HOIST TO COOLING TANK 96'
PULL THRU COOLING TANK 109'


HOIST FROM TANK 5'
PUSH ON MONORAIL 61'
TEMP AND SAMPLES
DUMP CRATE TO UNSCRAMBLERS
BY HAND ON MONORAIL 283'
CRATES
BY BELT 21'
SCRATCH CANS
OPERATE SWITCH
BOOSTERS 22'
FULL CAN LINES 397'
LABELER CABLE LINE 25'
LABELERS 6'
LABEL INSPECTION 10'
BOOSTER AND GRAVITY TRACK 16'
BOXER 4'
ROLLER TRACK 5'
INSPECT BOXING
TOP SEALERS 14'
ROLLER TRACK AND BELT 100'
LOAD ON PALLETS
FORK TRUCKS
SKID LOAD CHECKER
FORK TRUCK
IN WAREHOUSE
BOXER



which are peeled and cored and to which may be added one or more of the following optional ingredients: (1) the liquid drained from such tomatoes during or after peeling and coring; (2) the liquid strained from the residue after preparing such tomatoes for canning; (3) the liquid strained from mature tomatoes of such varieties; and (4) purified calcium chloride, calcium sulfate, calcium citrate, monocalcium phosphate, or any two or more of these calcium salts, in a quantity reasonably necessary to "firm" the tomatoes, but in no case such that the amount of the calcium contained in such salts is more than 0.026 percent of the weight of the finished canned tomatoes. It may be seasoned with salt, spices, or flavoring, either singly or in some combination.

DESCRIPTION OF BASIC CANNING OPERATIONS

All operations, from the receipt of the raw product at the cannery through casing, have been grouped into six key operations in this report. These are receiving, preparation, filling, sealing, thermal processing, and labeling and casing.

Preparation

This includes all the steps necessary to prepare the vegetable for filling into the can. These steps consist of washing, grading, trimming, peeling, pulping, and blanching.

Certain canneries cool the product in tanks of water. Others cool

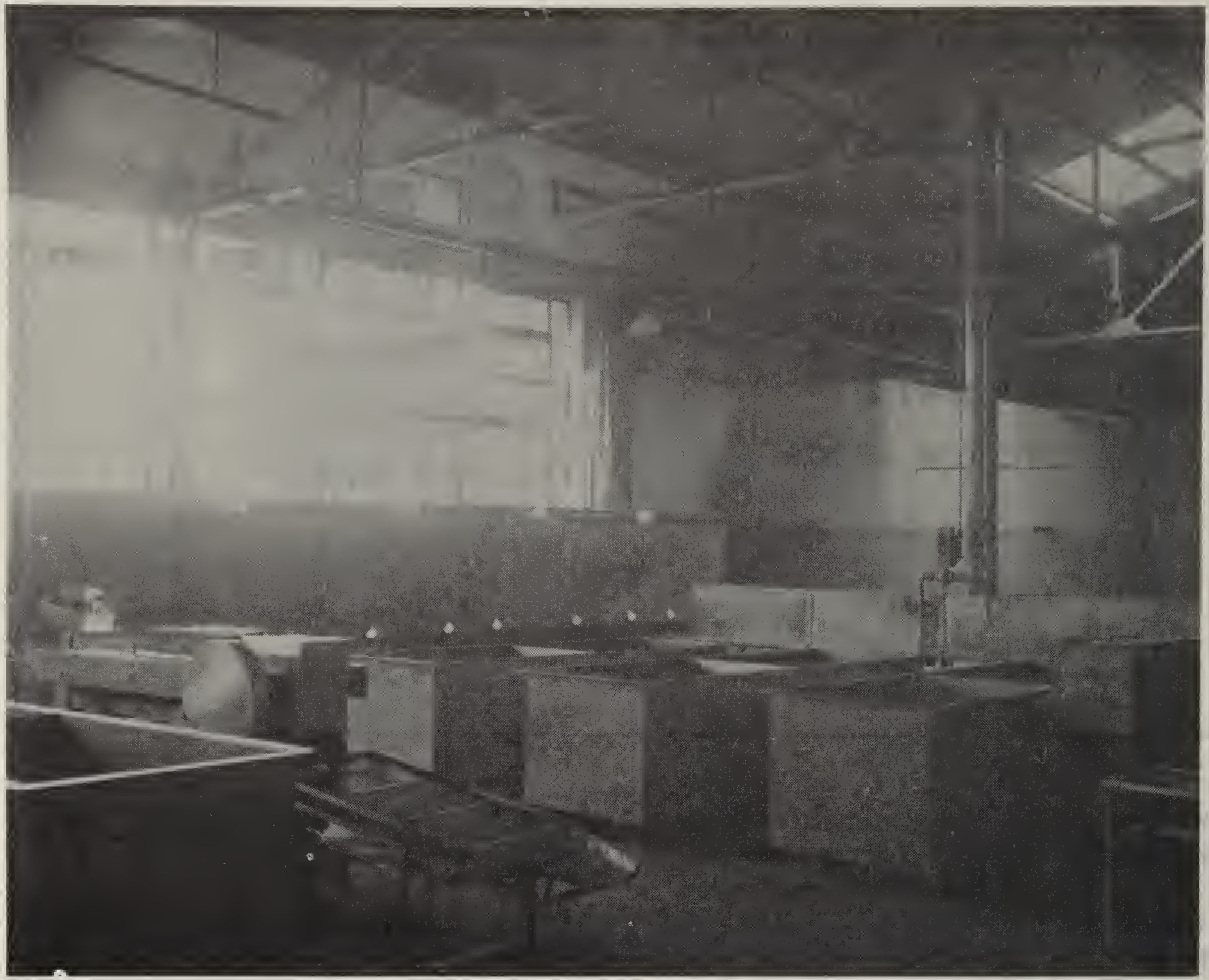


Fig. C Stainless steel mushroom processing equipment. Left to right, grader, storage tanks, and blancher.

the product in the same retort, or kettle, used for heat processing, thus precluding an accurate allocation of man-hours between heat processing and cooling. To maintain comparability of operations, the thermal processing operation in this report includes the cooling process.

Although the detailed technical aspects of vegetable processing vary with the character of the product, certain basic operations are common to all products. A brief description of some of these operations follows.

Washing. Washing is one of the most important though always the first operation in the canning process. In this step dirt and other foreign material are removed and the number of spoilage organisms present on the raw food is reduced. In general, washing is accomplished by equipment designed for different types of products. The vegetable usually is washed either on a roller belt or in a rotary drum by high pressure water sprays. Some products such as tomatoes are usually soaked in tanks of water before washing, to remove dirt which has dried on the surface of the vegetable.

With certain other products, washing is preceded by a "dry" cleaning treatment in which soil, dirt, leaves, and vines are mechanically removed from the food by agitating or revolving screens, or by strong blasts of air.

Grading and Sorting. Many products are graded according to size and quality and others are simply sorted to insure that vegetables having the same characteristics can be packed and labeled in accordance with accepted standards.

Size-grading usually is accomplished by passing the product through perforated screens or through the opening between accurately spaced bar rollers. Sorting is usually done by hand.

Blanching. Blanching is a heat treatment given to some products by immersing them in warm or hot water or exposing them to live steam followed by a cold spray or dip. The main purposes of blanching are to decrease the volume of the product, soften the fibrous plant tissues to

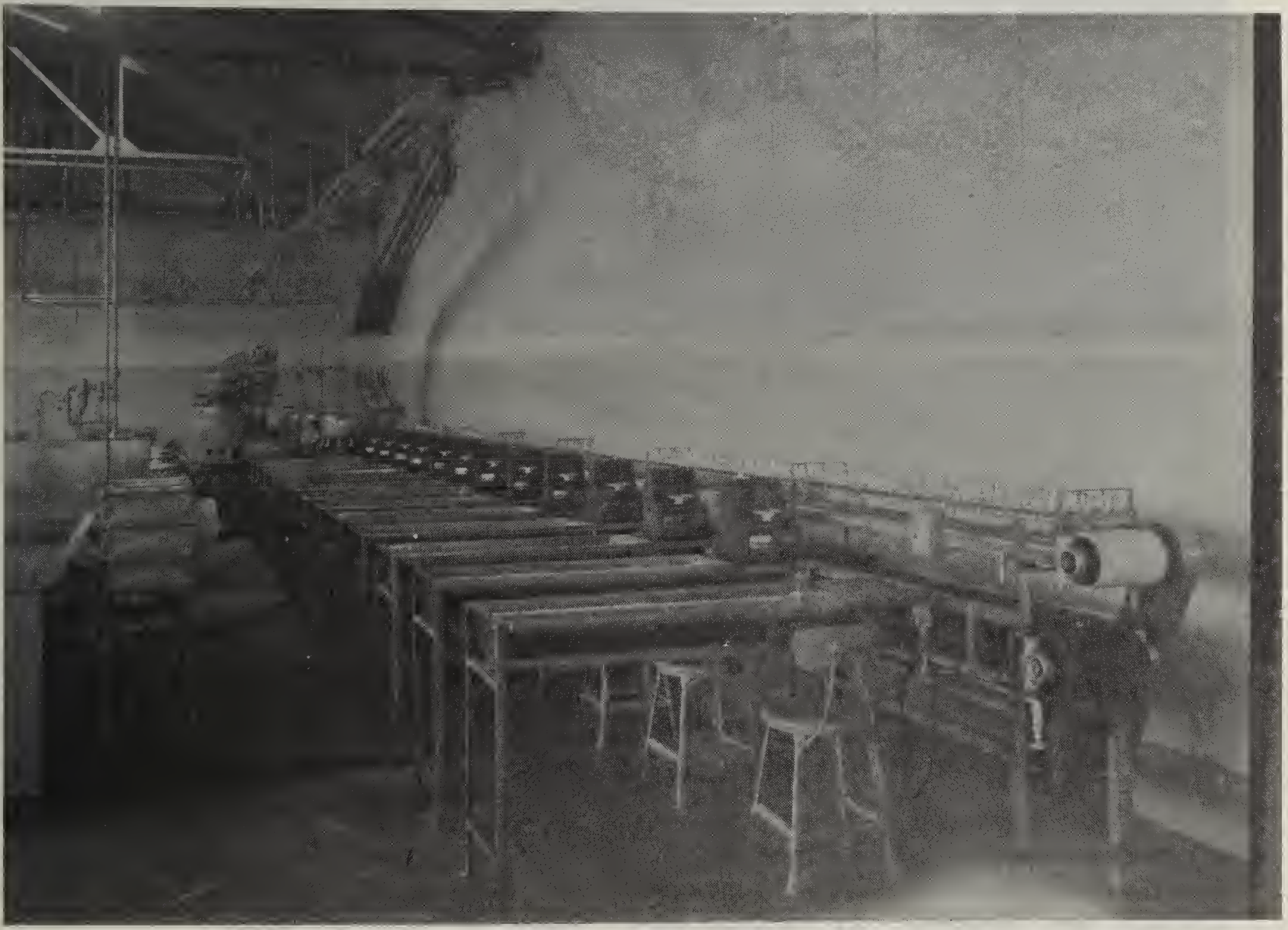


Fig. D Stainless steel tables for filling mushrooms into cans.

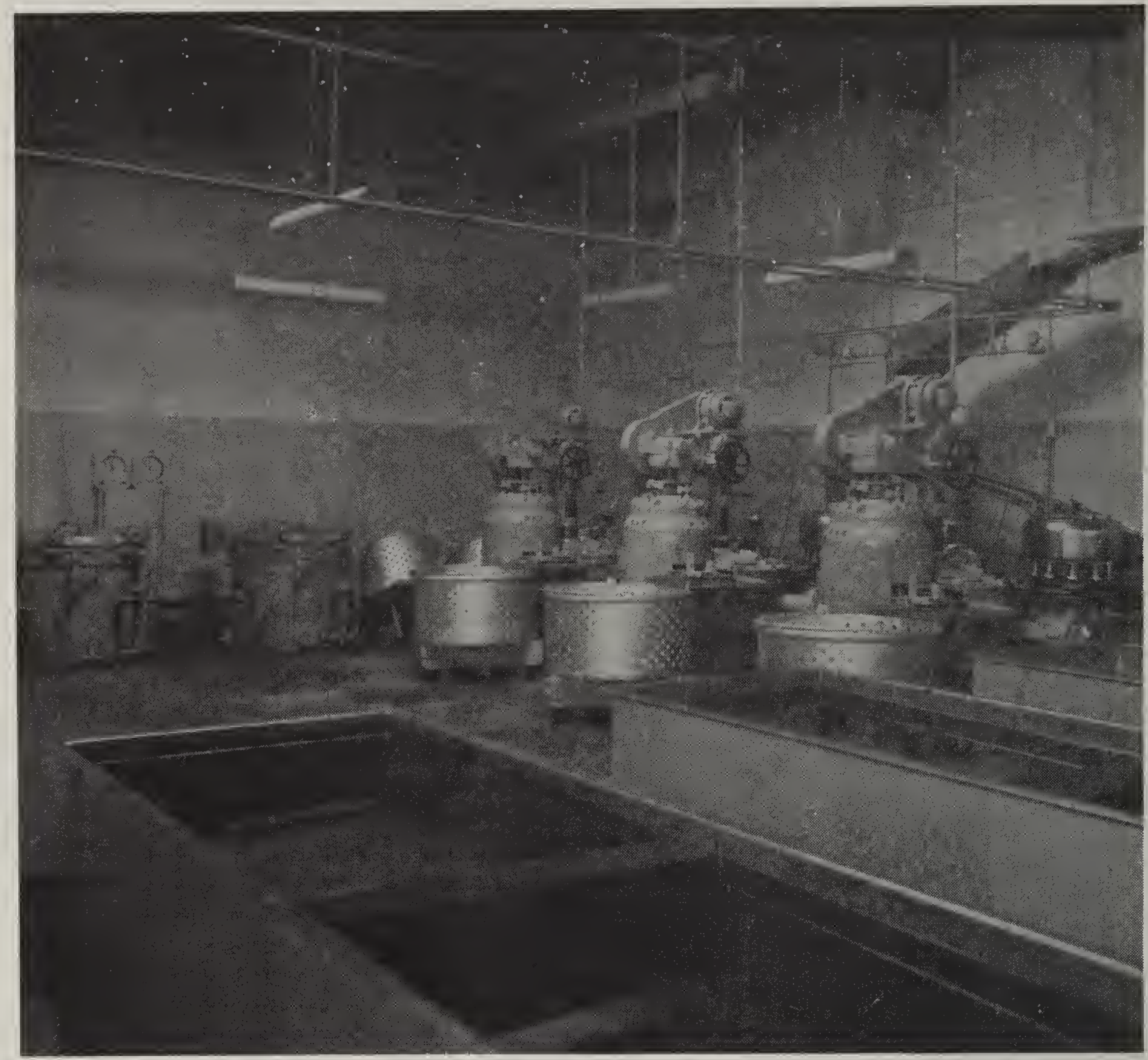


Fig. E Stainless steel equipment for processing mushrooms. Left to right, retorts, sealing machines which include "siruper," and "salt tablet" depositing machines.

facilitate packing, remove raw flavors, expel respiratory gases, and inhibit enzymic action.

Blanching usually is accomplished in specially designed equipment. The vegetables are conveyed through the blancher by various mechanical devices which can be adjusted to insure that the product is subjected to the required temperature for the proper time.

Filling

After preparation, most products are immediately packed into cans by high speed mechanical fillers. Products which do not lend themselves to mechanical filling are filled into the cans by hand.

Cans are packed sufficiently full to assure a satisfactory product after thermal processing. Slack filling may cause buckling and internal rusting of the cans. Overfilling slows heat penetration and may result in spoilage of the product.

Exhausting

Exhausting is the heat treatment given to the product after the cans are filled but before they are sealed. Exhausting the unsealed cans expels air and other gases from the raw material, and removes air pockets which may have formed between the food during the filling operation.

Exhausting is accomplished by mechanically passing the open can of raw food through an exhaust box in which steam or hot water expands the food and expels air and other gases contained in the food and in the headspace of the can.

With certain products, the exhausting operation is accomplished by preheating the food in kettles or tanks, filling it into cans at a sufficiently high temperature, and immediately sealing the can. For certain other products, the operation is accomplished by adding boiling water, sirup, or brine to the can containing the food.

Sealing

After exhausting, the open can containing the food is mechanically conveyed to the closing machine which double-seams the end of the can to make a hermetically sealed container. The seal prevents the entry of spoilage organisms into the container after the contents have been processed.

Thermal Processing

The thermal processing operation involves the exposure of the sealed container to boiling water or steam under pressure for a period of time sufficient to destroy spoilage organisms which may be present in the sealed can.

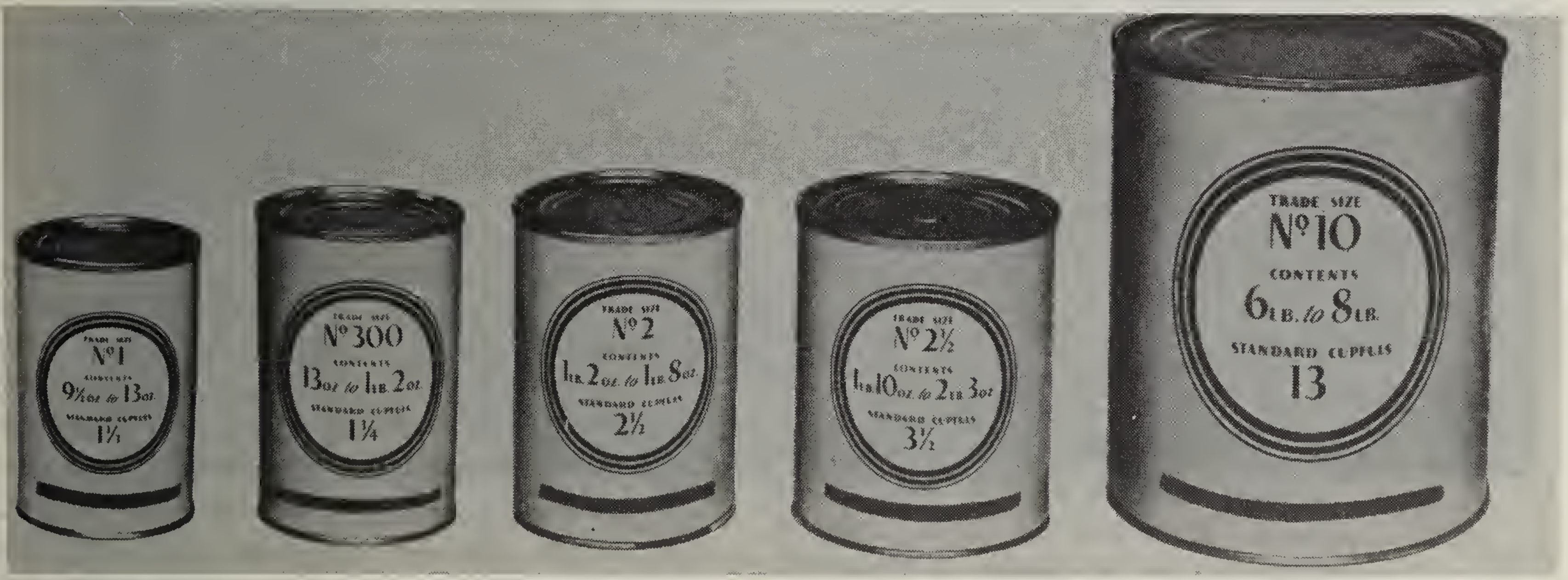


Fig. F Popular can sizes.

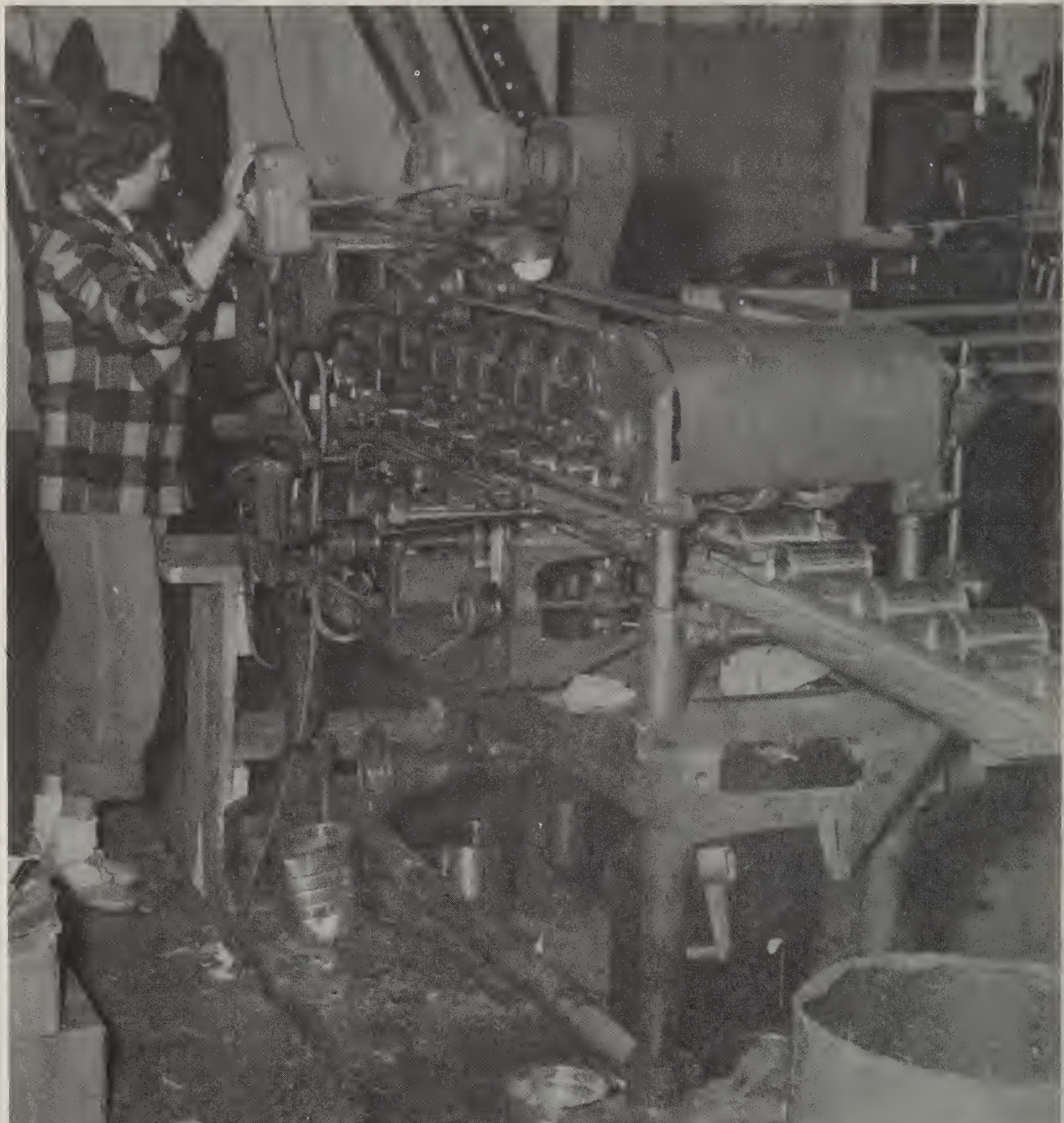


Fig. G Machine for labeling cans.

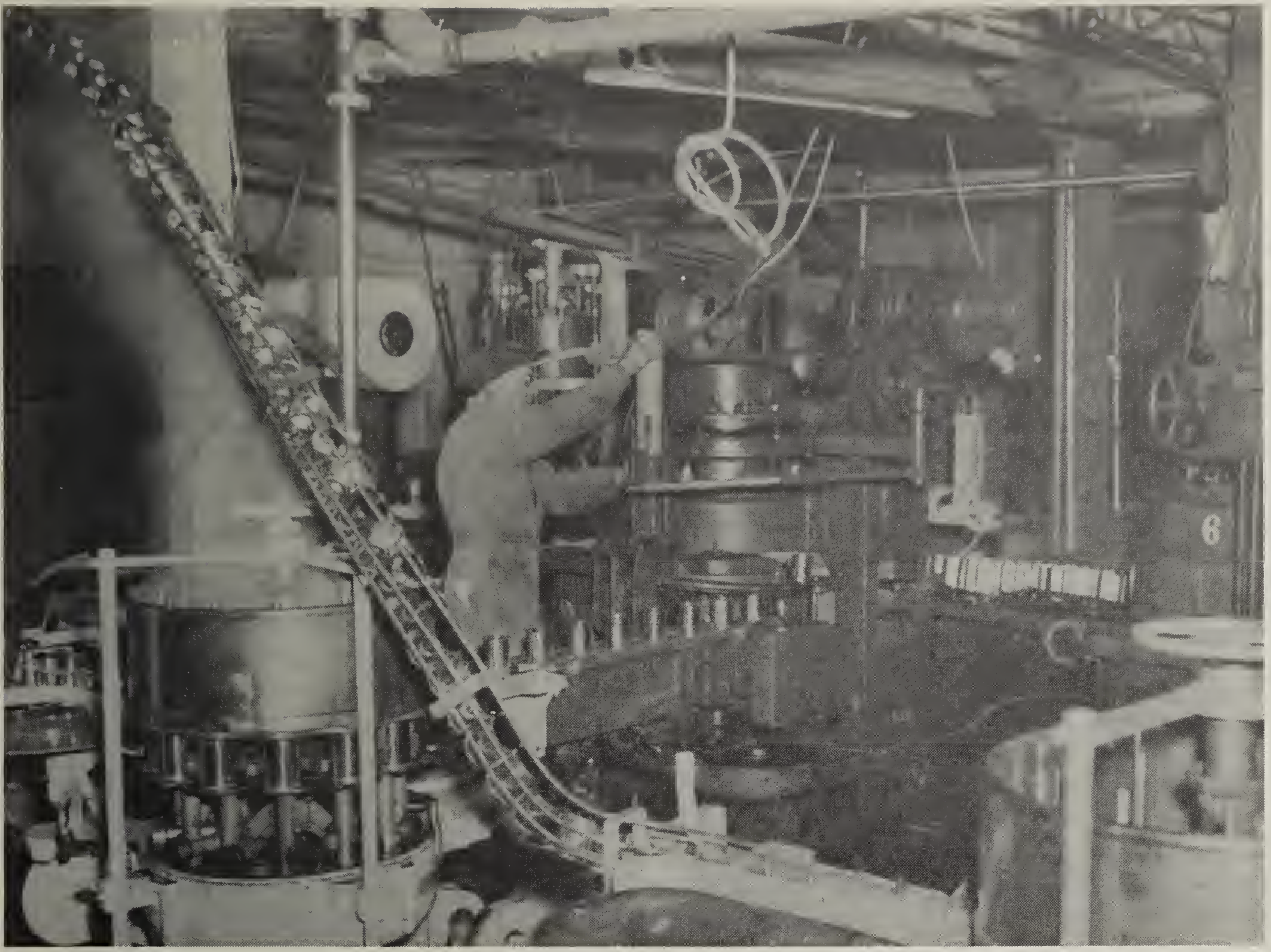


Fig. H Scalding machine. Workman is placing a carton of can tops in machine.

Cooling. Immediately after thermal processing the cans are cooled to prevent overcooking and changes in the texture of the food. Air cooling and water cooling are the two commonly used cooling techniques. The cans are cooled to a temperature of about 100°F., which is low enough to prevent overcooking and yet high enough to dry the cans and prevent rusting.

Air cooling is accomplished by removing the sealed containers from the retort and stacking them in the warehouse. The cans are generally stacked in a single row with enough space between rows to allow for the efficient circulation of air.

Of the several methods of water cooling, one cools the cans by flooding the retort with cold water. Another procedure removes the cans from the retort and immerses them in a tank of cold water or conveys them through a canal of cold water.

Large size containers processed under steam pressure must be cooled under pressure in the closed retort to avoid undue stress and strain on the container.

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CHAPTER II: CASE STUDIES

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CHAPTER II: CASE STUDIES

COLLECTION AND PRESENTATION OF DATA

The preparation of these survey data involved three major steps. A schedule was prepared calling for data on man-hours, production, and related factors. In the preparation of this questionnaire, the advice and counsel of recognized authorities in management and trade associations were obtained. Following careful checking and clearance by the United States Bureau of the Budget, the schedules were taken to the companies cooperating in this study. Data were gathered by personal conferences with top officials from the companies' records and experience. Finally, the data were evaluated, selected, and arranged into case-method studies as here presented.

The results show, for each company, the average number of man-hours actually required in a certain period to process one dozen cans of a specific product for the plant as a whole, and for certain key operations. The man-hour figures include those of workers directly employed on the various operations, and also those not directly employed on any one operation, such as workers engaged in supervisory, maintenance, and other similar functions. The data do not include the man-hours of persons engaged in office work, selling, and other general administrative duties.

The man-hours for the reported product are actual man-hours. Total man-hours and the man-hours by operations for each product were obtained from either the payroll report or factory time cards. In a few instances, because of a product mix, it was necessary to allocate man-hours to the product and operations. This was done by obtaining the ratio of the reported product to all products produced in the reporting period. This quotient then was applied, with proper allowances for the weight of different size cans, to the actual total factory man-hours to obtain the total number of man-hours required to process the reported product. Man-hours by operations were obtained, where necessary, by applying the same ratio to the total actual number of hours charged to a specific operation.

The Case Study Method

The "case study" method of presentation has been used in this report, wherever possible. Unless otherwise noted, figures refer to actual plants and operations. Averages which may be computed from the data should be handled with extreme caution because the firms comprising these case studies are not intended to be a sample of the universe nor are the products homogeneous.

MUSHROOM PROCESSING

A partial description of some mushroom processing operations in selected plants is presented in this section. No attempt is made to describe any operation completely. Rather, the purpose is to show some of the techniques used in four mushroom processing plants. The direct unit man-hour requirements by selected operations are presented in table 1.

It is not possible to make direct comparisons of the operations between the different plants in this report because the same steps in each operation are not uniform among the plants. In several of the plants certain steps are omitted in one operation but are carried out in a later one.

Receiving

Fresh mushrooms are delivered by trucks to the canneries where they are weighed and then taken either to the cutting table for immediate processing or to the refrigeration room for temporary storage.

Direct man-hours were obtained from three of the plants, the fourth plant was unable to supply man-hour data for this operation. Direct man-hours supplied by the three plants are:

Plant A -	0.0132
Plant B -	.0064
Plant C -	.0117

The receiving operation for the four plants are described below:

Plant A. The incoming mushrooms are weighed by the receiver (weigher). Handlers take the mushrooms from the weigher, place them on platform hand trucks, and move them to the cutting tables.

Plant B. The mushrooms are delivered to the cannery in baskets. The baskets are taken from the truck and placed on skids. A mechanical lift truck moves the skid from the receiving platform to the refrigerator room.

Plants C and D. Both plants utilize their truck drivers to unload mushrooms into the refrigeration room.

Preparation

The operation termed "preparation" in this report consists of cutting, cleaning, grading for size, and blanching. An exception to this sequence is plant C, for which unit man-hour requirements for grading and blanching are not included in the preparation of the mushrooms for the can. The description of the work flow in this cannery, however, includes its grading and blanching techniques. Conveyors and water flumes are used extensively to deliver mushrooms from cutting tables to the mechanical grader and to the blancher.

Direct man-hours were obtained from all four plants for this operation. They are:

Plant A -	0.2045
Plant B -	.1256
Plant C -	.2170
Plant D -	.2425

Plant A. Cutters with hand knives clean and prepare the mushrooms which are then thrown into a water flume which carries the mushrooms to a roller conveyor. This is the first inspection point. The inspectors clean the mushrooms further when necessary. From this inspection point the mushrooms move on a roller conveyor to an elevator conveyor which carries the mushrooms into a mechan-

Table 1. Direct man-hours by selected operations in 4 mushroom processing plants, U.S.A., 1951

Plant	Direct man-hours per dozen 4-oz. cans by operation					
	Receiving 1/	Preparation 1/	Filling	Sealing	Thermal processing	Labeling and casing
A	0.0132	0.2045	0.0341	0.0077	0.0026	0.0184
B	.0064	.1256	(2/)	(3/)	4/.0409	.0172
C	.0117	5/.2170	5/.0746	.0075	.0038	.0274
D	(6/)	.2425	.0475	(7/)	.0030	.0153

1/ Man-hours are given in terms of 1 dozen 4-oz. cans, although at this point the mushrooms have not been placed in cans.

2/ Included in thermal processing.

3/ Includes grading and blanching.

4/ Includes man-hours expended for filling and sealing.

5/ Man-hours for grading and blanching are not included.

6/ Information not available.

7/ Included in filling.

Table 2. Thermal processing data for 4 selected mushroom processing plants, U. S. A., 1951

Plant	Pressure (pounds per square inch)	Process temperature (degree F.)	Process time (minutes)	Method of cooling
A	15	245	30	Retort is flooded with cold water
B	15	250	20	Retort is flooded with cold water
C	15	240	23-25	Cooling pit
D	15	250	15	Air-cooled

ical size grader. The mushrooms drop by size through the perforations into tanks of water. A blancher operator takes the graded mushrooms from the tanks and places them in trays. The trays are carried on a roller conveyor through the blancher, which is an enclosed tunnel about 12 feet long and 1-1/2 feet high, and in which the mushrooms are subjected to a steam pressure of 4 pounds. As the trays of mushrooms emerge they are sprayed with cold water to permit handling, and placed in front of the fillers.

Plant B. The baskets of mushrooms are moved from the refrigerated room to the cutting tables on roller conveyors. As the mushrooms are cut they are thrown into water conveyors which perform the dual function of cleaning and moving. Whole mushrooms, buttons, and stems are separated by hand. The buttons are moved to the size grader by conveyor. As the mushrooms emerge from the grader they drop on a stainless steel belt table for inspection before the blanching process. After blanching, the mushrooms are again inspected and taken to the fillers.

Plant C. The cutting section is elevated about 3 feet above the floor level plant to facilitate the use of water flumes. Cutters get the mushrooms from the refrigerated room and dump them on the cutting tables. The cutters sit on each side of the cutting table which has two water flumes in the center, one for stems and pieces, the other for whole mushrooms. The individual flumes at each table run into lead-off flumes, one of which sends the whole mushrooms to a grader the other routing the stems and pieces to the blancher. As the women cutters clean and cut the mushrooms, they toss them into the proper flumes. The whole mushrooms are flumed to a grader elevator which carries them into a grader which separates them by size. The grader is a perforated metal tube about 15 feet long and 3 feet in diameter. The mushrooms drop through the grader into holding bins filled with water. Each bin holds mushrooms of specific graded sizes. As a specific size mushroom is to be blanched, an operator opens a valve on the holding bin and the mushrooms are flumed to the blancher. The mushrooms leave the blancher and drop on an inspection and filling table. As the mushrooms are inspected, the acceptable ones are pushed along by hand to the fillers.

Plant D. Baskets of mushrooms are moved to the cutting department where they are weighed, and placed on the cutting table having a conveyor belt running parallel to the table. The cutters, equipped with small hand knives, are placed along both sides of the table. These operators cut off roots and dirt and cut the stem from the button. The high-quality buttons are placed on the conveyor belt; the inferior buttons and the stems are placed in baskets and collected from the cutters. The conveyor belt moves the high-quality buttons to a button washer and dumps them into the water, where they are mechanically graded for size and dropped into tanks. Then, one size button at a time is passed through the steam blancher to the filling stations by a belt conveyor. The buttons are inspected before filling.

Filling

Mushrooms are moved from the blancher to the filling tables to which empty cans are brought by a conveyor. The filling operator (or "filler") takes an empty can from the

Table 3. Machinery and equipment used in 4 selected mushroom processing plants, by operation, U.S.A., 1951

Plant	Machinery and equipment	Number of units	Average age (years)	Capacity
	Receiving operation			
A	Scale	(1/)	(1/)	(1/)
	Platform hand truck	(1/)	(1/)	(1/)
B	Scale, Toledo Scale Co. platform pointweight, model #61	1	4	(1/)
	Lift truck, Fairbanks-Morse mechanical	3	10	2,000 lb.
	Radial compression system, Chrysler Corp., 25 hp	1	3	25 tons
	Compressor unit, Chrysler Corp., 5 hp	1	7	5 tons
	(Above 2 units, cooling system for refrigerators)			
C	(1/)			
D	(1/)			
	Preparation operation			
A	Cutting table	5	(1/)	(1/)
	Size grader, revolving perforated metal tube, designed by company	1	5	(1/)
	Blancher, designed by company	1	5	(1/)
B	Conveyor systems, 2 roller and 6 belt, at cutting tables	8	5	5,000 lb. per hr.
	Woven stainless steel belt inspection table, 1 hp	2	7	1,500 lb. per hr.
	Woven stainless steel conveyor belt, 1/2 hp	1	1	2,000 lb. per hr.

1/ Information not available.

Table 3. Machinery and equipment used in 4 selected mushroom processing plants, by operation, U.S.A., 1951 -- Continued

Plant	Machinery and equipment	Number of units	Average age (years)	Capacity
C	Size grader, revolving perforated metal tube, 3/4 hp unit motor	1	3	(1/)
	Blancher	1	3	1,200 lb. per hr.
D	Scale	1	8	(1/)
	Washer and grader, designed by company	2	15	(1/)
	Blancher	1	5	(1/)
	Filling operation			
A	Shadowgraph scale, table model, Exact Weight Scale Co.	(1/)	(1/)	(1/)
	Peerless siruper	(1/)	(1/)	(1/)
B	Empty can gravity washer and conveyor, American Can Co.	1	1	Variable
	Empty and filled can conveyor belts, 1/2 hp	2	1	Variable
	Shadowgraph scale, table model, Exact Weight Scale Co.	25	2	Variable
	Ayars 12-valve liquid siruper, 1 hp	(1/)	(1/)	(1/)
D	Scale	9	3	(1/)
	Sealing operation			
A	Salt tablet dispensing machine, Scientific Tablet Co.	(1/)	(1/)	(1/)
	Sealing Machine, model #400, American Can Co.,	1	5	120 cans per minute
B	Salt pill dispenser, 1/4 hp	1	3	200 cans per minute

1/ Information not available.

Table 3. Machinery and equipment used in 4 selected mushroom processing plants, by operation, U.S.A., 1951 -- Continued

Plant	Machinery and equipment	Number of units	Average age (years)	Capacity
B . . .	Sealing machine, model #400, American Can Co.	3	3	200 cans per minute
C . . .	Sealing machine, 3 hp. motor, American Can Co.	1	3	75 cans per minute
D . . .	Sealing machine, model #400 34 A, American Can Co.	3	5	(1/)
	Thermal processing			
A . . .	Retort, Food Machinery Corp. . .	2	20	3 crates per operation
	Overhead electric hoist, Reading Chain and Block Co.	1	(1/)	1/2 ton
B . . .	Retort, Food Machinery Corp. . .	4	10	2 crates per operation
	Automatic temperature controllers and recorders, Brown Instrument Co.	4	6	--
C . . .	Retort, Food Machinery Corp. . .	1	4	3 crates per operation
	Electric hoist	(1/)	(1/)	(1/)
	Cooling pit	(1/)	(1/)	(1/)
D . . .	Retort, Food Machinery Corp. . .	7	18	(1/)

1/ Information not available.

Table 3. Machinery and equipment used in 4 selected mushroom processing plants, by operation, U.S.A., 1951 -- Continued

Plant	Machinery and equipment	Number of units	Average age (years)	Capacity
	Labeling and casing operation			
A . . .	Labeling machine, Burt Universal Labeling Machine, model AUS, 1/2 hp	1	3	160 cans per minute
	Boxer, Burt	1	1	(1/)
	Case sealer, Standard-Knupp Co. . .	1	8	10 cases per minute
	Fork lift truck	(1/)	(1/)	(1/)
B . . .	Burt Universal Labeling Machine, model AUS, 1/2 hp	1	2	600 cans per minute
	Palmer Automatic Can Ejector, 1/4 hp	1	2	500 cans per minute
	Burt Automatic Case Packer, 3/4 hp	1	1	60 cans per minute
D . . .	Labeling machine, Chisholm & Ryder	1	10	(1/)

1/ Information not available.

conveyor, places it on a scale, hand-fills the can to its proper weight, and places the filled can on a conveyor belt leading to the closing machine.

Separate man-hours could not be obtained for this operation from each of the four plants (as shown in table 1, parts of this operation for two of these plants are included in other operations). Direct man-hours were obtained from the following three plants:

Plant A - 0.0341
Plant C - .0746
Plant D - .0475

Plant A. Empty cans are brought from a loft to the filling table by a conveyor so placed that it runs past the table. The filler takes an empty can from the conveyor belt, places it on the scales on the filling table, hand-fills the can with mushrooms to its proper weight, and places it on a belt conveyor leading to the closing machine. Water is added to the can of mushrooms by a siruping machine before it reaches the closing machine.

Plant B. A gravity washer-conveyor brings the empty cans from a loft to the filling section, washing them en route. The filling tables are arranged on both sides of a conveyor belt which conveys the cans to the fillers. A filler will take a can from the belt, place it on the scale, hand-fill the can with mushrooms, and place it on another conveyor belt leading to the closing machine. Just before sealing, the can is filled with water and a salt tablet is automatically placed in the can by a mechanical dispenser.

Plant C. As the mushrooms leave the blancher, they drop on a filling table to be inspected. The mushrooms are hand-pushed along the filling line to each succeeding filler by the previous filler. Each can is hand-filled, weighed, and placed on a conveyor belt leading to the closing machine.

Table 4. Peas: Direct man-hour requirements per dozen cans in 5 selected vegetable processing plants, by key operation, U. S. A., 1951

Plant	Product	Operation					
		Receiving	Preparation	Filling	Sealing	Thermal processing	Labeling and casing
H	Sweet peas; U.S. grades A, B, C; sieve sizes 1-6; No. 303 can . . .	0.009	0.022	(1/)	0.016	0.011	0.007
I	Early June peas; U.S. grades A, B, C; sieve size 1-6; No. 303 can	.006	.025	(1/)	.022	.013	.016
J	Early June peas; U.S. grades A, B, C; sieve size 1-5	.007	.032	.002	.004	.015	2/.016
K-1	Alaska peas, sieve size 3, No. 303 can	(3/)	.078	(4/)	(4/)	.032	2/.005
L-1	Peas, U.S. grade C, No. 303 can .	(3/)	5/.153	(1/)	.034	.044	2/.044

1/Included in sealing.
2/Does not include labeling time.
3/Included in preparation.
4/Included in thermal processing.
5/Includes vining time.

Table 5. Asparagus: Direct man-hour requirements per dozen cans in 2 selected vegetable processing plants, by key operation, U. S. A., 1951

Plant	Product	Operation					
		Receiving	Preparation	Filling	Sealing	Thermal processing	Labeling and casing
O	Fancy cut asparagus, No. 8Z tall can	0.008	0.074	0.018	0.005	0.002	0.019
S	Asparagus, cut spears, U. S. grade C, No. 2 can	.061	.175	.020	.009	.017	.053

Plant D. In front of the fillers run two conveyor belts. One belt brings the empty cans to the filler; the other brings the buttons. The cans are hand-filled, weighed, and placed on a conveyor belt leading to the sealing machine. On the way to the closing machine the cans are filled with brine piped down from an overhead brine tank.

Sealing

The filled cans of mushrooms are moved from the filling tables into the automatic closing machine on a mechanical conveyor. After the machine has sealed the lids on the cans they are placed in retort crates for transportation to the retort for thermal processing.

In this particular operation only two of the plants were able to determine direct man-hours. They are:

Plant A - 0.0077
Plant C - .0075

(Information regarding this operation for plants B and D is given in table 1.)

Plant A. Attached to the sealing machine is a salt tablet dispensing machine which drops one tablet into each can just before it is sealed. The sealed cans are removed from the closing machine table and placed uniformly in a metal retort crate by an electrically powered magnet which can lift as many as 20 cans at a time.

Plant C. The cans of mushrooms move from the filling table to the closing machine on a belt conveyor. As the sealed cans emerge from the closing machine, they drop haphazardly into a retort crate. The cannery considers this practice to be timesaving and allows for more efficient thermal processing because more can area is exposed to steam.

Thermal Processing

In this operation the retort crates are placed in pressure retorts and subjected to live steam under pressure for varying periods of time. At the end of the processing time the cans are cooled immediately to arrest the cooking process.

Direct man-hours were obtained from all four plants for this particular operation. Man-hours for Plant B include those for the filling and sealing operations and hence are much larger than those for the other three plants.

Plant A. The retort operator uses an overhead rail crane to bring the retort crate to the retort. The

Table 6. Tomatoes, tomato juice, and tomato puree: Direct man-hour requirements per dozen cans in 3 selected vegetable processing plants, by key operation, U. S. A., 1951

Plant	Product	Operation					
		Receiving	Preparation	Filling	Sealing	Thermal processing	Labeling and casing
L-2	Whole tomatoes, U.S. grade B, No. 2 can	(1/)	0.144	0.100	0.028	0.013	2/ 0.027
K-2	Tomato juice, No. 2 can	0.007	.010	(3/)	(3/)	.026	4/ .004
L-3	Tomato juice, U.S. grade A, No. 3 cylinder .	(1/)	.178	(5/)	.056	.020	2/ .035
K-3	Tomato puree, medium concentration, No. 10 . can	.071	.137	(3/)	(3/)	.264	(6/)
W	Tomato puree, U.S. grade A, No. 10 can . . .	.064	.265	.030	.025	(7/)	2/ .125

1/ Reported as indirect labor.
2/ Does not include labeling time.
3/ Included in preparation.
4/ 50 percent of product is labeled at time of production. The remainder is cased and stored.
5/ Included in sealing.
6/ Information on this operation not available.
7/ The can is hot-filled.

crate is lowered into the retort and the cans are subjected to a steam bath of 245°F. for 30 minutes. Cold water is then admitted to the retort and the cans are allowed to cool for approximately 10 minutes. The crate is removed from the retort by the same overhead crane and deposited on a dolly which is pushed to the labeling machine.

Plant B. The retort crates are placed in an upright retort and processed by steam for 20 minutes at a temperature of 250°F., after which the retort is flooded with cold water for 5 minutes to permit the cans to cool. The retort is then opened and the crates are removed, placed on three-wheeled trucks, and wheeled into the labeling section.

Plant C. The retort crates are lifted by an electric hoist and carried to the retort. The hoist deposits the crates in a vertical retort which is operated with steam under pressure. The cans are thermal processed from 23 to 25 minutes at 240°F. The steam is then shut off and the pressure is released from the retort. The crates are removed from the retort by the same electric hoist and then lowered into the cooling pit which is filled with cold water.

Plant D. The retort crates are taken from the sealing machine and placed in the retorts by an overhead crane. The cans are processed by steam for 15 minutes at a temperature of 250°F. The crates are then removed from the retort by the same overhead crane, placed on dollies, and taken into the warehouse for drying and air-cooling.

Labeling and Casing

After cooling, cans are either labeled immediately or stored in the warehouse to be labeled later. All four plants use an automatic labeling machine. Two of the plants have automatic case packers and sealing machines; in the other two plants the cases are packed and sealed manually.

For this operation all four plants reported their direct man-hours as follows:

Plant A - 0.0184

Plant B - .0172

Plant C - .0274

Plant D - .0153

Plant A. The cans are removed from the crate by an electrically powered magnet, and hand-fed to the automatic labeling machine. After the label is applied the cans roll along a straight roller conveyor to a semiautomatic case-filling machine. An operator places an empty carton against the machine and kicks a foot lever twice, each time pushing 12 cans into the carton. The operator then places the carton on a conveyor which carries it to a case-sealing and compression unit. This machine glues and folds the flaps of the carton, and the compressor then applies pressure to the glued surface to make the seal secure. At the end of the labeling and sealing line, a worker removes the carton from the conveyor and places it on a pallet which is carried to storage by a fork lift truck.

Plant B. Labels are applied to the cans by an automatic labeling

Table 7. Thermal processing data for 8 selected vegetable processing plants, by product, U. S. A., 1951

Plant	Product	Pressure (pounds per square inch)	Process temperature (degree F.)	Process time (in minutes)	Method of cooling
H . .	Peas, No. 303 can	10.3	240	34	Cooling canal
I . .	Peas, No. 303 can	(1/)	245	40	Cooling canal
J . .	Peas, No. 303 can	13-14	240	35	Retort is flooded with cold water
K-1 .	Peas, No. 303 can	10-12	240	30-35	Retort is flooded with cold water
L-1 .	Peas, No. 303 can	12	240	40	Cooling canal
O . .	Cut asparagus, No. 8Z tall can	10	240	30	(1/)
S . .	Asparagus, No. 2 can	15	240	18	Cooling tank
L-2 .	Whole tomatoes, No. 2 can	0	212	40	Cooling canal
K-2 .	Tomato juice, No. 2 can	0	212	35	Retort is flooded with cold water
L-3 .	Tomato juice, No. 3 cylinder	0	212	15	Cooling canal
K-3 .	Tomato puree, No. 10 can	0	212	15	Retort is flooded with cold water
W . .	Tomato puree, No. 10 can	(2/)	(2/)	(2/)	Air-cooled in warehouse

1/ Information not available.

2/ Puree is filled into No. 10 cans at a temperature sufficiently high to prevent spoilage.

Table 8. Man-hour requirements in labeling cases of specified size cans in a vegetable processing plant, U. S. A., 1951

Size of can	Number of cans per case	Labeling man-hours per case 1/	
		Direct labeling from the line	Labeling from warehouse 2/
No. 2	24	0.01489	0.07410
No. 303	24	.01489	.07410
No. 1	48	.03500	.05500
No. 10	6	.09500	.09600

1/ The labeling time for the various can sizes was obtained by dividing actual man-hours by the number of cases labeled.

2/ The man-hour requirements for labeling from the warehouse include the time to go to the warehouse, pick up the product, transport it to the labeling machine, label the cans, and recase them. It does not include time to return the labeled cases to the warehouse.

machine. From the labeler, the cans pass to an automatic can ejector which ejects poorly labeled or defective cans. An automatic case packer packs the cans of mushrooms into a carton which is then glued and sealed by an automatic case sealer. The sealed cartons are placed on a pallet and moved to the warehouse by a lift truck.

Plant C. The retort crate is taken to the labeling section where the cans are removed manually from the crate by workers and hand-fed to the automatic labeling machine. As the cans are labeled they roll down a conveyor to workers who pack the cartons by hand. Other workers then glue and fold in the carton flaps and place the carton on a conveyor leading into the warehouse.

Plant D. The cans are labeled by an automatic labeling machine and hand-packed into cartons. Glue is applied to the carton flaps by hand brushes and the carton is sealed. The cartons are then moved to storage on hand-carts.

SELECTED VEGETABLE PROCESSING

This section of the report presents information on the processing of peas, asparagus, whole tomatoes, tomato juice, and tomato puree in terms of unit man-hour requirements in selected operations and a partial description of processing operations. No attempt is made to describe any operation completely. The purpose is to give a cross sectional view of production practices and machinery in a limited number of American canneries. The direct unit man-hour requirements for six key operations are shown in tables 4 through 8. Together, these five tables cover eight vegetable processing plants.

RECEIVING AND PREPARATION

In this report, "preparation" connotes the preliminary preparation of the vegetable for filling into the can. It includes such steps as washing, cleaning, sorting, grading, trimming, peeling, pulping, and blanching.

The man-hours expended in this operation vary considerably among canneries. These variations are due mainly to the character of the product being processed. Pea processing is highly mechanized and requires a minimum amount of hand labor, whereas the preparation of asparagus and tomato products before filling into the can requires relatively more hand labor.

Peas

Plant H. A gooseneck elevator carries the peas from the hopper to a flotation washer which removes stones and particles from the peas. They are then pumped to a size grader and graded in sizes from one to six. As the peas drop through the grader they fall into hopper trucks which are pushed to a gooseneck conveyor. The peas are discharged into the conveyor which carries them to another washer for removal of any thistles that may be mixed with them. The peas then are flumed to a washer elevator which discharges them into the blancher, and from which they are passed to a shaker screen and on to picking tables where they are inspected visually.

Any imperfect peas or extraneous material are removed manually. The peas are then flumed to a quality grader which separates the young tender peas from the more mature ones. The peas are flumed to another shaker screen and into hopper trucks which discharge the peas to the filling machine.

Plants I, J, and L-1. A bucket conveyor moves the peas from the hopper to a green pea cleaning machine which removes leaves, vines, and bulk from the peas by a blast of dry air. The peas then pass to a flotation washer which separates any stones that may be mixed in with the peas.

Asparagus

Plant O. The asparagus is placed on a conveyor type cutting table where it is cut into four small sections. The cut asparagus falls onto an inspection table where the cuts are inspected visually. Any defective or unprocessable asparagus is removed by the workers and placed on a waste belt running parallel to the inspection table. From the inspection table, the pieces of asparagus are carried by elevator conveyor to a hot water drum washer, and are then passed successively to a cold water reel washer, into a hot water blancher, and finally into a cold water reel blancher. This blancher feeds the cut asparagus to a water flume table where the asparagus is again inspected. This flume runs into a hydroconveyor which is an overhead, water-filled tube, through which the asparagus is carried to the filling machine on the opposite side of the room.

Plant S. When the asparagus is received at the cannery, it is placed on a canner's fabric belt conveyor. Inspectors sit on each side of the belt and remove all asparagus which does not meet specifications or which contains any foreign matter.

From here the asparagus goes through the cutters and on to another belt conveyor where further inspection is made to insure that only the best asparagus is processed. This belt empties the asparagus into an elevator conveyor which takes the product to a rotary blancher. The asparagus is blanched by steam for 2 minutes at 180°F. This operation opens the heads of the asparagus so that dirt and sand can be removed. The asparagus is then passed through a rotary washer for removal of any dirt and sand missed by the blanching process. This washer also cools the asparagus so that it can be hand-packed immediately. From the rotary washer, the asparagus is conveyed on a belt to the filling machine.

Tomatoes

Plant L-2. Tomatoes are flumed to a tank where they are soaked for approximately 1 minute. To further clean the fruit, the tomatoes are sprayed with water, at a pressure of from 80 to 100 pounds, as they move from the soaking tank to the dry inspection tables, over which they pass for purposes of removing undesirable tomatoes. The tomatoes then pass through a hot water scalder which maintains a water temperature of 196°F. As the tomatoes emerge from the scalder they are subjected to a fine spray of cold water so as to crack the skin and facilitate peeling. The tomatoes are hand-peeled into 14-quart buckets, which are conveyed to the filling table by an overhead, hook conveyor.

Plant K-2. Hampers of tomatoes are hand-dumped into flumes leading to a slat conveyor. The conveyor carries the tomatoes to a washer which is a rotating drum with an internal spray washer. From the washer, a mat conveyor moves the tomatoes past operators who inspect, trim, and throw out undesirable tomatoes. On this same mat conveyor the tomatoes pass through a steam bath. The tomatoes then flow into a heating tank and are broken down by being forced through a screen. The juice is pumped to holding tanks, from which the juice is gravity-fed to finishing machines that remove pomace and roughage. After the finishing process, the juice flows to salting tanks having steam coils that maintain the juice at a temperature ranging from 190° to 200°F. The tomato juice is then gravity-fed through pipes to the filling machines.

Plant L-3. Tomatoes are inspected, trimmed, sorted, and fed to a machine which crushes the tomatoes and heats them to about 190°F. The preheated, crushed tomatoes then pass into the juice extractor from which the tomato juice is pumped into 100-gallon, stainless steel tanks where it is salted and cooked at 195°F. for approximately a half hour. During the cooking process the juice is agitated mechanically and flows by gravity to the filling machine.

Plant K-3. After the tomatoes have been preheated and broken down they are pumped into a stainless steel holding tank. The product is then gravity-fed to the pulpers, which further break up the tomatoes and strain out skins, seeds, cores, and other residues. From the pulpers the puree is gravity-conveyed to glass-lined tanks with steam coils where the puree is concentrated to the desired specific gravity. The puree is gravity-fed successively to the finishing machines (which refine the puree further), holding tanks, and finally the filling machines.

Table 9. Machinery and equipment used in 8 vegetable processing plants, U. S. A., 1951

Plant	Machinery and equipment	Number of units	Average age (years)	Capacity
	Preparation operation			
H . .	Model 6 monitor cleaner	2	5	10,000 lbs. per hour
	Tenderometer, Food Machinery Corp.	1	3	(1/)
	Olney washer	1	12	12,000 lbs. per hour
	Scott Viner washer	1	12	12,000 lbs. per hour
	Size grader, Sinclair Scott 3-reel graders	2	5	15,000 lbs. per hour
	Washer, Scott Viner (EL - 800) . .	2	20	12,000 lbs. per hour
	Blancher, Scott Viner	2	5	12,000 lbs. per hour
	Picking table, Berlin Chapman . . .	8	4	3,000 lbs. per hour
	Quality grader, Olney	2	5	10,000 lbs. per hour
I . .	Terrel clipper mill	3	15	(1/)
	Olney de-stoner	3	15	(1/)
	Blancher	3	20	(1/)
	Carter shaker	4	10	(1/)
	Lewis gravity separator	4	15	(1/)
	Shaker washer	7	20	(1/)
J . .	Clipper green pea cleaner	2	(1/)	150 cases per hour
	De-stoner (Olney type).	2	15	(1/)
	Squirrel cage washer	1	8	(1/)
	Blancher, Food Machinery Corp. . .	1	25	300 cases per hour
	Flotation washer	1	2	(1/)
	Shaker washer, Food Machinery Corp.	1	5	(1/)

1/ Information not available.

Plant W. After the tomatoes have been graded they are dumped manually into a soaking tank. From the soaking tank a paddle-type elevator takes the tomatoes to a rotary washer. The tomatoes fall through this washer onto the sorting and trimming table where they are inspected and trimmed as necessary. This table is a belt conveyor at the end of which a small elevator takes the tomatoes to the pulping machine. After pulping, the tomatoes are pumped through a double cylinder preheater which raises the temperature of the tomatoes to about 170°F. From the preheater the tomatoes are pumped to the cooking tanks which have steam coils in the bottom. Although these tanks have an approximate capacity of 750 gallons, only about 400 gallons of product are filled into a tank and it is cooked down to about 250 gallons, depending upon the desired specific gravity of the puree. After cooking, the puree is gravity-fed through pipes to the finishing machines. From the finishing machine the product is pumped to a storage tank which holds the puree at a temperature suitable for hot-filling. The puree is gravity-fed from the storage tank to the filling machine.

FILLING

The variations in unit man-hour requirements are attributable to the operating characteristics of the filling machines, the nature of the product, and the technique by which vegetables are filled into the cans. Clean, empty cans are brought to the filling machine by a conveyor; the filled cans are carried away automatically to the next operations.

Peas

Plants H, I, J, and L-1. In these plants, cans are filled with peas from multipocket, mechanical filling machines capable of maintaining accurate fills at a high rate of speed.

Asparagus

Plant O. The asparagus cuts are pumped to the filling machine through an overhead hydroconveyor. At the filling machine, workers feed empty cans to the machine from the cartons in which the tins were received. After the cans are filled, several workers remove the excess from overfilled cans or add asparagus cuts to the underfilled ones.

Plant S. The asparagus is placed into cans by a semiautomatic packing machine. From the filling station, the cans are taken by a conveyor to the exhaust box where they receive an exhaust of 170°F. While in transit to the exhaust box, salt is added to the can by an automatic salt-dispensing machine. The can is then filled with water and carried through the exhaust box on a chain conveyor.

Tomatoes

Plant L-2. Buckets of tomatoes are brought to the filling table on an overhead hook conveyor. About 1-1/2 ounces of tomato juice and a 30-grain salt tablet are placed in the cans, and the whole tomatoes are hand-packed into the can, which is filled with hot tomato juice and passed through a live steam exhaust box. It takes 2 minutes for one can to pass through the exhaust box.

Table 9. Machinery and equipment used in 8 vegetable processing plants, U. S. A., 1951 --Continued

Plant	Machinery and equipment	Number of units	Average age (years)	Capacity
	Preparation operation			
L-1	Clipper green pea cleaner	3	20	1,200 lbs. per hour
	Farrell green pea cleaner	1	20	2,000 lbs. per hour
	Clipper hopper truck	8	10	1,200 lbs. per hour
	De-stoner (home-made, flume type) .	1	10	3,600 lbs. per hour
	Scott washer	1	20	3,600 lbs. per hour
	Scott blancher	1	20	3,600 lbs. per hour
	Elevator boot and buckets, Food Machinery Corp.	1	10	(1/)
	Picking table, 30" wide, 10' long, Food Machinery Corp.	3	10	(1/)
	Stainless steel tank with agitator, 100-gallon capacity	1	5	60 gallons per hour
L-2, L-3	Soaking tank, 42" wide, 62" deep, 10' long	1	9	20 tons per hour
	Portable flume, 24" long, 12" deep, 10" diameter	1	9	20 tons per hour
	Roller inspection table, 24" wide, 8' long, 18 ft./minute	1	5	450 bushels per hour
	Hot water scalder, 16'7" long, 3'10" wide, A. K. Robins and Co. .	1	15	500 bushels per hour
	Peeling table, 20" wide, 57' long with rubber belt, (home-made) . .	2	1	10 tons per hour

1/ Information not available.

During this time the cans are heated to a temperature of 95°F.

Plant L-3. The filling machine is set in a pit so that the tomato juice can flow by gravity from the cooking tank to the filling machine.

Plant W. This plant has a 250-gallon capacity storage tank which maintains the temperature of puree at about 170°F. The puree is gravity fed to an automatic six-valve filling machine which fills the cans to the exact distance from the top of the can.

SEALING

The filled can is conveyed immediately to an automatic closing machine which double-seams the lid to the can to form an airtight container. The variations in unit man-hour requirements for this operation are accounted for partially by differences in the capacity of the sealing machines and the size of the can being sealed.

Peas

Plant H. The cans of peas move to the closing machine on a belt. As the cans are sealed, they are loaded by a hydraulic crate loader into retort crates which are pushed on dollies to the retort area.

Plant I. After the cans have been filled with peas and brined, the cans are transported on chain conveyors to clinching machines which attach the lids to the cans but do not seal them airtight. The cans then enter the closing machine where they are subjected to a partial vacuum, and the lids are sealed on to make an airtight container. The sealed cans are loaded mechanically into retort crates which are pushed to the retorts.

Plant J. After filling, the cans are moved on a revolving table to a guided can conveyor and into the sealing machine. The sealed cans are deposited manually in retort crates placed next to the sealing machine. The crates are lifted from the side of the sealing machine by a hoist on to a monorail which conveys the retort crates directly to the retorts.

Plant K-1. The sealed cans are loaded manually into the retort crates which are conveyed to the retorts by an overhead electric tram rail hoist.

Plant L-1. As the cans are sealed they are placed manually in retort crates, which are pushed to the retorts on three-wheeled dollies.

Asparagus

Plant O. The cans are sealed by an automatic sealing machine. Lids for the cans are placed in the machine by workers who also load the sealed cans in retort crates.

Plant S. The sealed cans drop from the closing machine into retort crates which are transported to the retorts by an overhead hoist on a rail.

Tomatoes

Plants L-2, L-3, K-2, and K-3. This operation is performed in the same manner as it is in plants K-1 and L-1, respectively.

Plant W. Number 10 cans are filled with hot puree and sealed. The sealed cans are loaded on pull trucks and taken directly to the

Table 9. Machinery and equipment used in 8 vegetable processing plants, U. S. A., 1951--Continued

Plant	Machinery and equipment	Number of units	Average age (years)	Capacity
	Preparation operation			
L-2,3	Crusher preheater, Food Machinery Corp.	1	15	30 gallons per minute
	Juice extractor, Ayas	1	15	40 gallons per minute
	Stainless steel tank with agitator, 100-gallon capacity	1	5	60 gallons per minute
O . .	Hot water drum washer, A.K.Robins and Co.	(1/)	(1/)	(1/)
	Cold water reel washer, A.K.Robins and Co.	(1/)	(1/)	(1/)
	Hot water blancher, A.K.Robins and Co.	(1/)	(1/)	(1/)
	Hydroconveyor and scavenger reel, Chisholm-Ryder	1	(1/)	(1/)
S . .	Urshall bean cutter, model No. 30C .	3	2	1-1/2 tons per hour
	Rotary blancher, 25' long, 3' in diameter	1	(1/)	(1/)
	Rotary washer, 10' long, 3' in diameter	1	(1/)	(1/)
W . .	Grading scale, Detecto X-47100-8 .	3	3	100 lbs.
	Soaking box, 10'x3'x3', paddle type elevator on end	5	20	(1/)
	Rotary washer, Berlin Chapman and Food Machinery Corp., model No. 26	5	20	7-1/2 tons per hour
	Sorting and trimming belt, 2'x16', 18" sorting belt	5	20	(1/)
	Pulper, Langsenkamp, model No. 118	5	7	10 to 20 tons per hour
	Preheater, Chisholm-Ryder, V-35" model No. PHA-A508 double cylinder	1	1	(1/)
	Cooking tank, 4-1/2' diameter x 6'3" deep, Langsenkamp	5	3	750 gallons
	Finisher, brush type, Langsenkamp .	1	40	20 to 30 gal. per minute

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1/ Information not available.

warehouse where the cans of puree are stacked to cool.

THERMAL PROCESSING

The sterilizing or thermal processing operation varies with each vegetable. Except in the case of tomato products, this operation involves the exposure of the sealed cans to live steam in the steam-tight pressure cooker for a certain length of time and at a certain temperature and pressure. The length of the thermal processing depends upon the processing temperature. The higher the temperature the shorter the processing time. Tomato products do not require temperatures in excess of the boiling point of water (212°F.); hence, they are sterilized with the boiling water in open retorts for varying periods of time. Some tomato products, juice and puree for example, may be processed by filling at a sufficiently high temperature. The can is then sealed and inverted. After a short holding period it may be water-cooled or the cans may be stacked properly in the warehouse for air-cooling.

Direct unit man-hour requirements are also influenced considerably by the size of the can being processed and by the method of cooling the can. Some canneries cool the cans by admitting cold water into the retort whereas other canneries remove the metal retort crates from the retort and immerse them in a tank of cold water. Another method of water cooling is to remove the retort crate from the retort and mechanically convey the crate through a canal of cold water. The cans are cooled to a temperature of about 100°F. so that enough heat remains to dry the can and prevent rusting.

Thermal-processing data as reported by eight canneries are presented in table 7.

Peas

Plant H. Crates containing the cans of product to be thermal processed are lifted from the dollies by a hoist and lowered into the retort. The retort lid is bolted down and live steam is admitted to the retort. The cans are heat-processed for 34 minutes at a temperature of 240°F. Then the crate is removed from the retort by a hoist and conveyed through the cooling canal on a tram rail.

Plant I. A hoist places the retort crates in the retort where the cans of peas are heat-processed for 40 minutes at a temperature of 245°F. The retort crates are then hoisted out of the retort and placed on a monorail conveyor extending the length of the cooling canal. This conveyor is set at a slight angle so that the retort crate moves gradually through the canal of water by force of gravity. To speed the movement of the crate through the canal, the crate is also pulled along.

Plant J. The retort crates are lowered into the retort by a hoist on an overhead monorail crane. The cans of peas are thermal processed for 35 minutes at 240°F. The retort then is flooded with cold water to arrest cooling. When the cans are sufficiently cooled, the crates are hoisted from the retort and placed on a dolly.

Plant K-1. The crates are placed in the retort by a hoist. The cans are processed by live steam for 30 to 35 minutes at 240°F., and are then cooled to a temperature of about 100°

Table 9. Machinery and equipment used in 8 vegetable processing plants, U. S. A., 1951 -- Continued

Plant	Machinery and equipment	Number of units	Average age (years)	Capacity
	Preparation operation			
W . .	Holding tank, stainless steel, heating coils in bottom, Langesenkamp	1	2	200 gal.
	Filling operation			
H . .	Ayars filler, 10 pocket No. C 9313 .	1	10	180 cans per minute
	Hansen filler, 8 pocket No. MH 309 .	1	10	160 cans per minute
I . .	Hansen filler and Ayars filler . .	7	15	150 cans per minute
J . .	Filler, Continental Can Co.	1	10	350 cans per minute
L-1 .	Filler, Ayars pea and bean filler, 10 pockets	1	15	180 cans per minute
L-2 .	Stainless steel trough, 4' wide, 12' long, (home-made)	1	15	15 tons per hour
	Live steam exhaust box, 25' long with 45' track	1	1	75 cans per minute
L-3 .	Filler, Ayars 8-pocket juice filler	1	15	15 cans per minute
O . .	Filler, Food Machinery Corp. . . .	1	(1/)	(1/)
S . .	Chisholm-Ryder hand packer, changeable pack hole ring-44" stainless steel cover	1	4	(1/)
	Morton automatic salt machine . . .	1	(1/)	(1/)
W . .	Preelds filling machines, 6 valve No. 10 cans, Food Machinery Corp.	2	10	30 cans per minute

1/ Information not available.

to 110°F. by flooding the retort with cold water for 15 minutes. An electric hoist removes the crates from the retort.

Plant L-1. This plant has two batteries of retorts. One consists of a group of retorts arranged in a circle and serviced by an overhead boom-type steam hoist. The other battery consists of retorts set up in a straight line, and serviced by a monorail electric hoist. Retort crates are removed from the dollies by one of the hoists and lowered into the retort. The cans are heat-processed for 40 minutes at a temperature of 240°F. At the end of 40 minutes the crate of cans is removed from the retort by a hoist and hooked on to a trolly which takes them through the cooling canal and into the warehouse. The cans remain in the cooling canal for about 35 minutes to reduce the temperature of the product to approximately 110°F.

Asparagus

Plant O. The retort crates are hoisted from the dollies and lowered into the retort. The cans of asparagus are processed at 240°F. for 30 minutes. After thermal processing the cans are set aside for about 10 days because the asparagus cuts would break down into a puree if the cans were to be moved excessively during this interim.

Plant S. The crates are transported from the sealing machine and placed in the retort by the overhead hoist. The cans are thermal processed for 18 minutes at 240°F. The crates are hoisted from the retort and deposited in a cooling pit where the cans are cooled to a temperature of 105° to 110°F. After cooling, the crates are removed from the pit, placed on a dolly, and pushed by hand to the labeling and casing machines.

Tomatoes

Plant L-2. See Plant L-1 for description of thermal processing, cooling equipment, and manner of loading the retort and cooling the cans.

Because tomatoes do not require temperatures in excess of the boiling point of water, the cans are processed in open retorts. The plant uses the same pressure retort for tomato products as for products requiring temperatures higher than the boiling point of water. When tomatoes are thermal processed, however, the cover of the retort is not closed and the product is cooked in boiling water (212°F.) for 40 minutes. After cooking, the crates are hoisted from the retort and lowered into the cooling canal where the cans are cooled to about 125°F. in 35 minutes.

Plant K-2. The crates are lowered into the retort by a hoist. The retort is the same as the one used for other products. However, the cans of tomato juice are not processed under pressure. The lid of the retort remains open and the cans are cooked in boiling water for 35 minutes. The retort is then flooded with cold water and the cans are cooled to a temperature of about 100° to 110°F.

Plant L-3. See plants L-1 and L-2 for a description of the thermal processing operation and layout.

The cans of tomato juice are cooked in open retorts at 212°F. for 15 minutes, after which they are cooled for about 35 minutes to reduce the temperature of the product to about 125°F.

Table 9. Machinery and equipment used in 8 vegetable processing plants, U. S. A., 1951 -- Continued

Plant	Machinery and equipment	Number of units	Average age (years)	Capacity
	Sealing operation			
H . .	Sealing machine, model 400 SF, American Can Co.	2	5	300 cans per minute
I . .	Clincher, Continental Can Co. . . .	7	10	154 cans per minute
	Closing machine Continental Can Co.	7	10	154 cans per minute
J . .	Sealing machine, Continental Can Co.	1	(1/)	400 cans per minute
L-1 .	Sealing machine, Angelus 69-P . . .	1	8	180 cans per minute
L-2 .	Sealing machine, Angelus No. 26 . .	1	8	75 cans per minute
O . .	Sealing machine, American Can Co. .	1	(1/)	(1/)
S . .	Sealing machine, Continental Can Co.	4	(1/)	Max. 250 cans per minute
O . .	Sealing machine, model PDS, Continental Can Co.	1	(1/)	30 cans per minute
	Thermal processing operation			
H . .	Retort, Berlin Chapman	15	20	2,100 lbs. per hour
	Cooling canal 50, single width, Berlin Chapman	1	20	(1/)
I . .	Retort	27	25	4 crates per operation
J . .	Hoist, Hawkins	1	(1/)	(1/)
	Retort	11	20	4 crates per operation

1/ Information not available.

Plant K-3. The crates are placed in the retorts by a hoist. Steam-heated water is then admitted to the open retort and the cans are processed for 15 minutes in boiling water. The retort is then flushed with cold water and the cans are cooled for 20 minutes to a temperature of 100° to 110°F. The crates are removed from the retort by an electric hoist, placed on a hand truck, and moved to temporary storage.

Plant W. As the puree is hot-filled into No. 10 cans, no thermal processing is necessary.

LABELING AND CASING

The details of the labeling and casing operations vary among canneries and directly influence the level of unit man-hour requirements. Some canneries merely case the unlabeled cans of the product and store them in the warehouse until the peak of the canning season has passed. Other canneries label and case the cans immediately after cooling. In some canneries the cans are labeled automatically and cased by automatic machines into cartons which are then glued and sealed by machine and conveyed to storage by lift trucks or mechanical conveyors. Other canneries label the cans automatically and there the mechanization ceases. The cans are cased by hand and the cartons are glued and sealed manually. However, the cartons are always conveyed to storage by some type of mechanical device.

Peas

Plant H. After passing through the cooling canal, the crates are hoisted to a set of tram rails which carry the crates to a hydraulic crate unloader. The cans enter a guided can conveyor belt and are moved to the labeling machine. After labeling, the cans enter a casing machine and are packed into corrugated cardboard cartons. The unsealed cartons move by belt conveyor to a gluing and compressing machine which glues and seals the carton. The cartons are loaded on pallets and moved to storage.

Plant I. The crates are hoisted from the cooling canal and dumped onto unscramblers--automatic machines which discharge the cans in an upright position on a conveyor belt. The cans are thus moved to the warehouse where they are cased without labeling. The boxes of peas are loaded on cardboard skids and stacked in warehouse by a fork truck. Very few cans are labeled during the packing season. Most of the labeling is done in the off-season. The cans cased during the packing season are dumped into the unscrambler which feeds them to a labeler cable line. The cans are labeled by machine. From the labeler, the cans roll down a gravity track to the boxing machine. The sealed cartons are loaded on pallets which are moved to storage by a fork lift truck.

If any labeling should be desired during the packing season, the labeling machine is introduced into the line just before the boxer machine.

Plant J. The unit man-hour requirements as shown in table 4 are for casing only. The retort crates are taken to the warehouse and dumped on the unscrambler. The unlabeled cans are cased by an automatic caser and placed in storage. When a sale of canned goods is made, the cartons are removed from storage, the cans are removed from the carton, labeled with the purchaser's label, and repacked into the cartons.

Table 9. Machinery and equipment used in 8 vegetable processing plants, U. S. A., 1951 --Continued

Plant	Machinery and equipment	Number of units	Average age (years)	Capacity
	Thermal processing operation			
L-1,2 L-3	Retort, Standard Food Machinery Corp.	17	15	(1/)
	Hoist, steam, boom type	1	25	1 ton
	Hoist, electric, runs on track . .	2	5	1/2 ton
	Cooling tank, 75' long, (home-made).	2	15	
O . .	Retort, A. K. Robins and Co., Food Machinery Corp.	6	(1/)	(1/)
S . .	Retort	3	4	3 crates per operation
	Hoist, Robins-Myers, electric chain on tram rail	2	1	1 1 ton 1-1/2 ton
	Cold water pit, 72" x 42"	1	5	(1/)
	Labeling and casing operation			
H . .	Labeler, Standard Knapp, adjustable labeler	1	5	700 cases per hour
	Caser, Standard Knapp, type F. . .	1	5	700 cases per hour
I . .	Unscrambler, Standard Knapp	2	17	(1/)
	Labeler, Standard Knapp	3	(1/)	(1/)
	Boxer, Standard Knapp	1	15	880 cases per hour
	Top sealer, Standard Knapp	1	12	1,200 cases per hour
	Fork truck, Clark	2	4	(1/)
J . .	Caser, Food Machinery Corp.	1	(1/)	480 cases per hour
L-1,2 L-3	Stacker, Stevedore Jr.	1	4	(1/)
	Hand-operated hydraulic lift truck	2	10	(1/)
O . .	Labeler, Burt Machinery Co.	1	(1/)	(1/)
S . .	Nu-way automatic labeling machine; model C-10	1	3	200 cans per minute
	Nu-way casing machine	1	1	10 cases per minute

1/ Information not available.

Plant K-1. After cooling, the cans of peas are stored in the warehouse to be graded and labeled at a later date. The reported unit man-hour requirements of this plant do not include labeling time for the reported production.

Plant L-1, L-2, and L-3. [2] The reported unit man-hour requirements do not include labeling time. As the crates come from the cooling tank, they are conveyed to the warehouse where the cans are hand-packed into cartons and transported to storage by a hand-operated hydraulic lift truck. The cartons are stacked by a case stacker.

Asparagus

Plant O. Labeling and casing are automatic operations. The cans are fed to the labeling machine. Workers inspect the labeling and remove cans with defective labels. The labeled cans are packed into cartons and sealed automatically. The sealed cartons are stacked on pallets and moved to the warehouse by a lift truck.

Plant S. The cans are labeled and cased by automatic machines, and the cartons are placed on a wooden pallet which is transported to the warehouse and stacked by a lift truck.

Tomatoes

Plant K-2, and K-3. Half the products are labeled and cased at the time of production. The other half are cased but not labeled or sealed. The unsealed cases are taken to be labeled and sealed at a later date. The direct unit man-hour requirements in table 6 are for the direct storage of unlabeled cans.

When cans are labeled from the line, the retort crate is dumped into the unscrambler which feeds the cans to a conveyor leading to the labeling machine. After the cans are labeled, they move on an elevator belt conveyor to a hand operated boxing machine. The cartons move through a top and bottom carton sealer and onto a roller conveyor, from which workers remove them and stack them on pallets which are transported to the warehouse and stacked by a lift truck.

Plant W. The direct unit man-hour requirement is for casing and storage only. Labeling time is excluded because cans are labeled in the slack season or when they are shipped to purchasers.

After the cans have cooled, they are cased by hand and the cartons are stacked by a stacking machine.

Labeling time is charged at the following rates established on actual hours. Time does not include any warehouse handling or recasing: to hand label Nos. 1 and 2 cans takes respectively 0.0377 hours per dozen cans; to machine label Nos. 10 and 46 cans takes 0.2450 hours per dozen cans for each size.

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[2] L-2, and L-3 are tomato products.

Case Study Data on
Productivity and Factory Performance

PROCESSED FOODS: CANNED VEGETABLES

CHAPTER III: LABOR AND MANAGEMENT POLICIES

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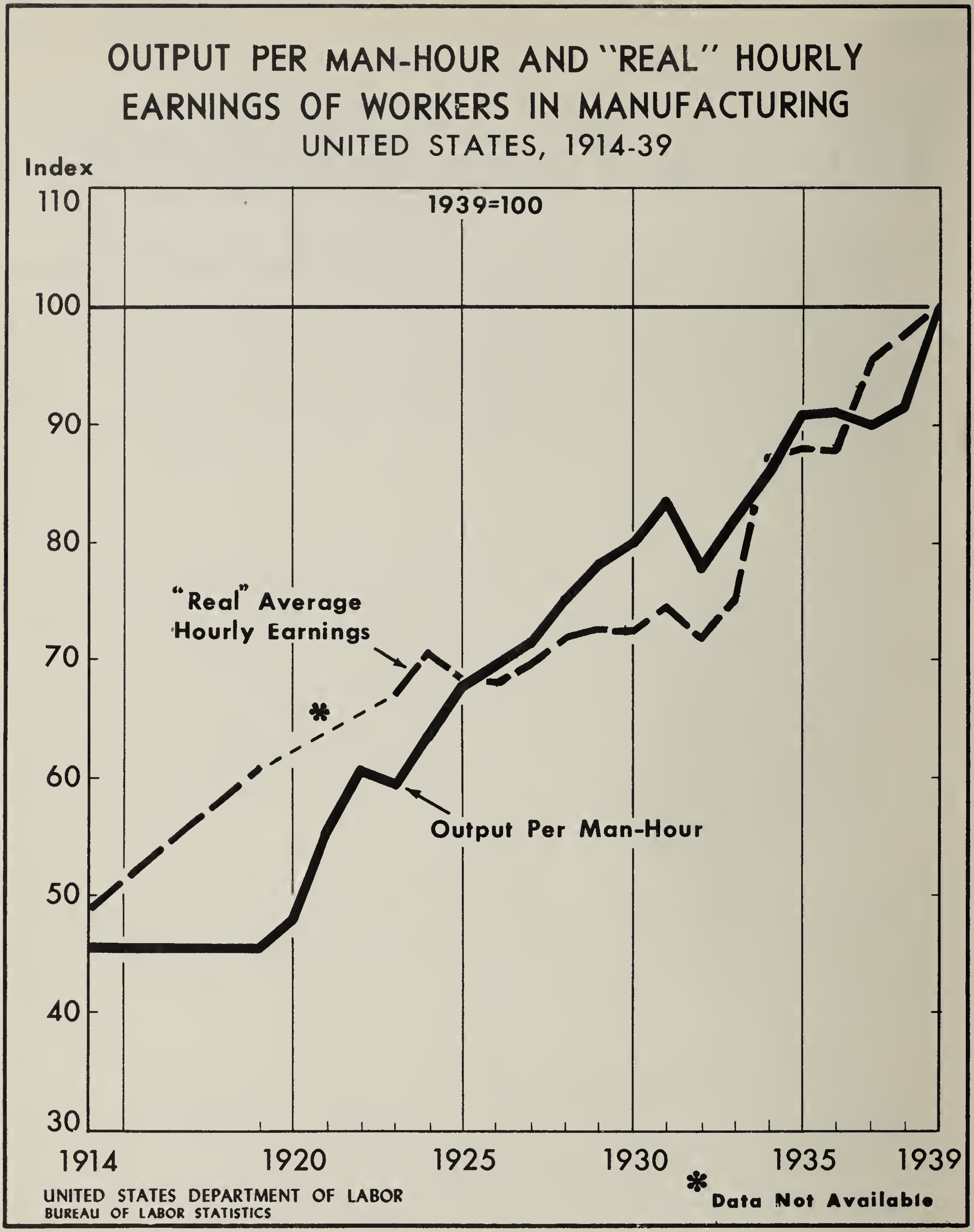

Fig. I (Real wages and productivity chart).

CHAPTER III: LABOR AND MANAGEMENT POLICIES

Labor Background

Workers' earnings, along with the earnings of other groups in the United States, have increased in "real" as well as in monetary terms as a result of almost continuous improvements in productivity. The Bureau of Labor Statistics estimated that between 1909 and 1947 the average real weekly earnings of factory workers doubled, whereas the workweek declined a fifth. These substantial improvements in income could not have been achieved except for increased output per man-hour of work made possible by a constantly improving technology of production. Although all workers have benefited from greater productivity, workers in industries with strong unions have generally been in the forefront in sharing the gains from increased productivity. In addition to higher pay and shorter hours per week, workers have also shared the returns from greater productivity in the form of "fringe benefits," such as paid holidays, vacations, pensions, and rest periods.

Despite the advantages arising from technological change, both organized and unorganized labor have on many occasions in the past resisted the introduction of new methods or machinery because of the threat of unemployment. Examples of management and labor working together to successfully cope with the problem are given toward the end of this chapter.

The average levels of income of workers in U. S. factories and in the canning and preserving industry in the period since World War II are shown in tables 11 and 12. (In table 10 an attempt is made to eliminate confusion arising from different currencies by showing the cost of common commodities in terms of minutes of work required of the average factory worker for their purchase.)

Average hourly earnings in the canning and preserving industry rose from $1.04 in 1947 to $1.28 in 1951, an increase of 23 percent, while the average workweek increased only one-half hour (table 11). During the same period, the Consumers' Price Index of the United States Bureau of Labor Statistics rose about 16 percent. This index represents changes in the prices of a fixed market basket of goods and services purchased by moderate-income families in large cities. A larger increase in wages than in prices paid by the average employee in the industry enabled him to maintain an adequate level of living.

The employees in canning and preserving establishments were not able to attain the same level of earnings as that of the average manufacturing establishment worker. If the average cannery worker living in one of the large cities of the United States in 1951 purchased the component goods and services of the Consumers' Price Index, and had received wage increases since 1947 solely on the basis of the 16-percent rise in the cost of that "market basket" of goods, he would have received only $48.06 a week. Table 11 shows, however, that his actual average weekly earnings in 1951 were $51.42, a net gain in his real earnings.

Average hours and earnings available for seven individual canneries in the study are shown in table 12.

Industry Background

The first commercial cannery in the United States was established in New York City in 1819. The following year another cannery started operations in Boston, Mass. In the interval between 1840 and 1860 canneries were established in Maine, Maryland, Pennsylvania, New York, and Delaware. During the Civil War, heavy demands for canned foods for the Northern Armies resulted in a rapid expansion of the number of plants and the volume of production. In the years immediately following the war, the industry continued to expand as a result of increasing technology and the trend of the population from rural to urban areas. By the beginning of the 20th century, processing plants had been established all over the United States.

Both World War I and II exerted expanding influences on the canning industry. Between 1942 and 1945, the industry produced a record wartime pack of canned foods to meet military and civilian demand.

Today, the canning industry in the United States is a billion dollar industry with canneries in 45 of the 48 States and in Alaska, Puerto Rico, and the Hawaiian Islands.

In 1947 there were 2,265 establishments engaged primarily in canning fruits and vegetables, fruit and vegetable juices (including soups), and in manufacturing preserves, jams, and jellies. These establishments employed an average of 135,974 persons of which 121,916 were production and related workers. Of these 2,265 canneries, 1,634 (72 percent) employed an average of fewer than 50 persons.

According to the preliminary 1950 Annual Survey of Manufactures, the Canning and Preserving (excluding Fish) Industry had an average of 129,499 employees in 1950. Of this number 113,780 were production employees who worked 213,893,000 man-hours and received $237,991,000 in wages.

The highly seasonal fruit and vegetable canning industry does not maintain a large permanent work force. During the off season, plants have small crews who recondition the machinery and perform other maintenance work. These are regular employees and are primarily men. As the canning season gets under way, most canneries recruit a seasonal work force to supplement the small permanent force. In many areas housewives and students constitute a large part of this seasonal work force. Other sources of labor supply include migrants who follow the harvests, and persons who are employed in other seasonal occupations.

Unions in the Industry

In 1951, approximately two-thirds

of the production workers in the Canning and Preserving Fruits, Vegetables, and Sea Foods Industry [3] were unionized. The predominent unions in this industry classification are: International Brotherhood of Teamsters, Chauffeurs, Warehousemen, and Helpers of America, (AFL); Amalgamated Meat Cutters, Butchers and Workmen of North America, (AFL); Federal labor unions with local unions directly affiliated with AFL; and the United Packinghouse Workers of America, (CIO).

"In 1943, approximately 40 percent of the more than 200,000 workers employed during the seasonal peak in the canned fruit and vegetable industry were covered by union agreements."[4] Of this number of workers, approximately 75 percent were under agreements with locals of Federal labor unions directly affiliated with the AFL; 20 percent were under agreement with the United Cannery, Agricultural, Packing, and Allied Workers of America (CIO); and the other 5 percent were under agreements with various other unions. [5]

Collective bargaining agreements in the United States range from those purely local in scope and negotiated by representatives of a local union with individual employers, to collective bargaining agreements which are national in scope affecting an entire industry and signed by the national representatives of organized workers and organized employers. Most agreements covering cannery workers are local in scope and are negotiated individually with the canneries. There are a few collective bargaining agreements in this industry which are negotiated on an area basis; but there is no industry-wide contract for the canning industry.

Fringe Benefits [6]

Fringe benefits have become an important part of both collective bargaining negotiations and the personnel policies of many establishments whose employees are not unionized. Recent surveys made by the Bureau of Labor Statistics of wages and related practices of selected canneries in the areas [7] around Baltimore, Md., and Los Angeles, Calif. show that in the Baltimore area 62 percent of the plant employees received from 5 to 6 paid holidays a year, and slightly more than 54 percent of the plant employees were in establishments having insurance or retirement pension plans.

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[3] Standard Industrial Classification Industry number is 203 and it includes the following industries: Canned sea foods (S.I.C.2031); cured fish (S.I.C.2032); Canned fruits, vegetables, soups, preserves, jams, and jellies (S.I.C.2033); Dried and dehydrated fruits and vegetables (S.I.C.2034); pickled fruits and vegetables, vegetable sauces and seasonings, and salad dressings, (S.I.C.2035); and frozen fruits, vegetables, and sea foods (S.I.C.2037).

[4] Union Agreements in the Canned Fruit and Vegetable Industry, Bulletin No. 794, U. S. Department of Labor, Bureau of Labor Statistics, 1944.

[5] Ibid.

[6] Includes nonwage benefits such as paid vacations, holidays, and pensions.

[7] The Baltimore area study was based on 7 plants employing 1,983 persons. The Los Angeles area study covered 12 plants employing 2,905 persons. In ~~both areas, only selected canneries with~~ 21 or more workers were studied.

Table 10. Amount of worktime required of average factory worker and of average cannery worker to buy selected food and clothing items, U. S. A., 1947

Item	Unit of measure	Factory worker		Cannery worker	
		Hours	Minutes	Hours	Minutes
Food					
Milk	1 liter	-	9	-	11
Eggs	1 dozen	-	34	-	40
Oranges	1 dozen	-	21	-	25
White flour	1 kilogram	-	11	-	13
White wheat bread . . .	1 kilogram	-	13	-	15
Butter	1 kilogram	1	28	1	45
Salt pork	1 kilogram	-	49	-	58
Potatoes	1 kilogram	-	7	-	8
Coffee	1 kilogram	-	51	1	1
Clothing					
Men:					
Heavy wool suit . . .	1	36	43	43	38
Work shirt	1	1	19	1	34
Socks	1 pair	-	16	-	19
Street shoes	1 pair	6	32	7	46
Work shoes	1 pair	5	56	7	3
Women:					
Wool coat	1	17	53	21	15
Street dress	1	8	20	9	54
House dress	1	2	31	2	59
Rayon and nylon stockings	1 pair	-	53	1	3
Street shoes	1 pair	5	26	6	27

Paid vacations ranged from less than 1 week for employees after 6 months' service to 2 weeks for employees with more than 15 years. Approximately 75 percent of the plant workers having more than 1 year and less than 15 years' service received 1-week's paid vacation and 10.5 percent received less than 1 week. After 15 years of service, almost 75 percent of the plant workers received 2-weeks' paid vacation and 10.5 percent received less than 1 week.

In the Los Angeles, Calif. area slightly more than 81 percent of the plant employees received either 3, 6, or 7 paid holidays; of this total 55.7 percent received 7 paid holidays, 20.3 percent received 6 holidays with pay, and the remaining 5.4 percent received only 3. Fifty-nine

Table 11. Average weekly hours and earnings of production workers in the canning and preserving industry, and all manufacturing industries, U. S. A., selected years, 1909-51

Item	Year				
	1951	1950	1947	1939	1909
Consumers' Price Index 1/ (1935-39=100)	185.6	171.9	159.6	99.4	(2/)
Average weekly hours					
Canning and preserving industry	40.2	39.3	39.7	(2/)	(2/)
All manufacturing industries	40.7	40.5	40.4	37.7	51.0
Average weekly earnings					
Canning and preserving industry	$51.42	$46.81	$41.33	(2/)	(2/)
All manufacturing industries	64.88	59.33	49.97	$23.86	$9.84
Average hourly earnings					
Canning and preserving industry	1.279	1.191	1.041	(2/)	(2/)
All manufacturing industries	1.594	1.465	1.237	.633	.193

1/ Consumers' Price Index for moderate-income families in large cities, U. S. Bureau of Labor Statistics.

2/ Information not available.

percent of the plant workers were employed in establishments having insurance or retirement pension plans for their employees.

Paid vacations ranged from 1 to 2 weeks depending on length of service. After 1 year 88.7 percent of the plant employees received 1-week's paid vacation and 6.5 percent received 2 weeks. After 2 years, 19.1 percent received 2 weeks and 74.4 percent received 1 week. All plant workers having more than 5 years' service received paid vacations. Approximately 69 percent of these workers received 1 week and the remaining 31 percent received 2 weeks.

Table 13 presents the fringe benefits received by employees of plants H and K, both of which are partially unionized. In plant K, the office workers are nonunion, whereas all the plant workers, with the exception of supervisory workers, belong to a union. These employees are affiliated with the United Steel Workers Union, (CIO). At plant H, all regular or continuous employees except supervisory, clerical, office, time study, seasonal, agricultural, and personnel employees and heat tenders and guards are unionized and affiliated with The Cannery Employees and Food Processors, of the Amalgamated Meat Cutters, Butchers, and

Workmen of North America, (AFL).

The omission from table 14 of data on the other canning establishments participating in this study does not necessarily mean that the employees in these establishments do not receive various fringe benefits but rather that these data were not readily available.

Adjustments to Technological Change

Labor and management in the United States have always been faced with problems arising from changes in processes and the introduction of new machinery. The problems generally include determination of earnings, workloads, work schedules, displacement of special skills by new machinery and methods, and, in some cases, actual displacement of workers. Over the past 25 years, with the more rapid growth of labor unions, adjustments and solutions to these problems have been reached in many instances on a case-by-case basis as a result of negotiations between the two parties. The success of the solutions and adjustments has depended almost entirely on the attitudes and procedures with which labor and management approached each case and only incidentally on the technical details of the change itself.

Moreover, negotiations over technological change in many fields of manufacturing indicate that the experience gained from a case in one industry is applicable to problems of change in other industries. Consequently, the methods and ideas developed in negotiations over technological change are used in many industries in addition to the one in which a problem first appeared. Technical details concerning machines, processes, and conditions of employment still require agreement on a case basis within the framework of ideas and methods handed down from past experience.

The examples of adjustment to technological change that follow have been selected because of the techniques and procedures they illustrate, without regard to the industry in which they occurred.

Example A [8]

The union has not challenged management's right to introduce new machinery or methods or to set the speed of work, in part because the stability of employment and the gradual expansion of the industry have not threatened the security of the individual worker. At the same time, most of the improvements have made the work easier and, because of increased mechanization, some have resulted in higher job rates under a job evaluation program which places emphasis on responsibility. Management has also retained the right to hire, partly because the slow inflow of new workers has constituted no threat to the unions. Nor have the unions sought to represent the foremen, partly because the foremen were no threat to the unions because of the generally favorable attitude of management toward the unions.

8/ Abstracted from Case Study No. 1, Crown Zellerbach Corp. and the Pacific Coast Pulp and Paper Industry; Causes of Industrial Peace, National Planning Association.

Table 12. Average weekly hours and earnings of workers in 7 selected canning and preserving establishments, U. S. A., 1951

Plant	Average weekly hours	Average hourly earnings
A	34.2	$0.839
B	45.0	.987
D	41.8	.884
I	37.8	1.160
J	26.2	.951
K	44.0	1.242
L	40.0	.865

Example B [9]

Steelworkers, in common with all other Americans, naturally welcome increasing labor productivity, if only because they realize that it augments the fund from which higher living standards may be realized. Yet increasing labor productivity, whether reflecting technological improvements or more effective human teamwork, also arouses the worker's natural fear of demotion or displacement. The steel industry has not yet solved this long-standing human problem or even approached it as broadly as has the automobile industry in the General Motors contract of 1950.

Nevertheless, both management and union leaders at Minnequa are making a sincere effort to minimize the adverse effects on workers of introducing modernized and improved mechanical and human teamwork processed. This is reflected in the care with which incentives arrangements and seniority problems were handled when a new Morgan rod mill was installed at the Minnequa plant in 1949.[10] The same case illustrates the painstaking attention which is given to the classification of jobs involving new processes. Technological displacement was handled by the parties in conformance with a subsection of the contract's seniority clause, which outlines a procedure of mutuality in the instance of interplant transfers required by additions of new plants and discontinuance of other plants.

After the new mill was put into operation following the voluntary shift of workers from the old rod mill, unexpected problems had to be resolved, and these were still being straightened out 8 months after installations had been completed. The mill not only ran at partial capacity for some time, but also job classifications were tentative, and incentive standards were temporarily held in abeyance, with retroactive pay to be based on production records from the time the mill started.

The union accepted the company's tentative job classifications with the understanding that time would be allowed for workers to become fully acquainted with their work. This involved no demotions, but take-home pay was decreased in those instances where incentive earnings, temporarily held in abeyance, would have exceeded hourly rates. This was offset to some extent when the 10-hour shifts were adopted, with the contract providing for overtime premiums for work in excess of 8 hours.

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[9] Abstracted from Case Study No. 9, Minnequa Plant of Colorado Fuel and Iron Corporation and two locals of United Steelworkers of America; Causes of Industrial Peace, National Planning Association.

[10] Ibid. See discussion in chapter V, p. 50.

In approaching the comprehensive task of establishing job classifications for the new mill, the initial step of management and the union was to reach agreement on job descriptions. Then followed a reexamination of the company's tentative classifications in the light of the agreed-upon job descriptions. Based on the 30 labor grades established by the national committee studying wage inequities, a method of pooled judgment was applied in an attempt to classify the jobs, as mutually defined, into corresponding labor grades. Although the contract provides that in cases of disagreement the company may proceed unilaterally, subject to later appeals through the grievance procedure, every effort was made to reach agreement by this method of pooled judgment which drew on practices in comparable situations in other plants and in the industry generally. Of 23 classifications discussed in April 1950, 10 were accepted by the union without dispute, the company made concessions on 7, and the union provisionally withdrew objections on the remaining 6. The outcome was that many workers were upgraded, owing to the fact that some jobs which were reclassified affected relatively large concentrations of workers. An example was the flying shear job, which was raised from labor grade 9 to labor grade 10 in a mutual attempt to harmonize the new rod-mill rates with rates generally paid for like or similar work. In all of this processing the union did not waive its contractual right for reconsideration in the light of further information or living experience.

Certainly, management in pulp and paper no longer enjoys unrestricted powers. It has yielded its traditional rights chiefly in those fields now generally conceded to be subject to collective bargaining: wages, hours, vacations, and the like. Only in the joint safety program has it gone beyond the customary boundaries. Management has retained the essential right to direct, and the necessary powers to operate efficiently - the right to hire, to discharge for cause, to promote partly on the basis of efficiency, to change methods and machines, to set output standards, to exercise sole control over foremen, and to have work proceed without interruption. At the same time, consultation with the unions has been widely practiced and management has discussed many problems with them on which it has the sole discretion to make decisions. Almost without exception, plant managers assert that time spent in conference with union representatives is not a grudging concession but a real investment paying steady dividends.

If sovereignty of management means retaining those powers essential to the achievement of quantity and quality of production, then little, if any, real impairment of it has taken place.

Essentially the same mutuality exists at Minnequa in the classification of new jobs as in the reclassification of old jobs affected by technological change or organizational flow changes. In all such proceedings the company's position

Table 13. Welfare benefits of production workers in 2 selected food processing plants, U. S. A., 1951

Item	Plant H	Plant K
Years of service required for paid vacations of		
1 week	1	(1/)
2 weeks	5	(1/)
3 weeks	15	(1/)
Number of paid holidays per year	2	0
Number of days paid sick leave per year	(2/)	0
Pension and insurance paid by		
Employer	(3/)	(3/)
Employer and worker	(3/)	(3/)
Shift differential (amount) 4/		
2nd shift	(3/)	$0.05/hr.
3rd shift	(3/)	$0.05/hr.
Rate of pay for work for		
Saturday	(3/)	1.0
Sunday	5/ 1.5	1.0
Holiday	1.5	1.0
Overtime 6/	1.5	1.5

1/ Employees with from 1 to 3 years of service receive a paid vacation of 5 days. Employees with 1 year of service, however, are paid at the rate of 48 x straight hourly time, whereas employees with 3 years of service are paid at the rate of 56 x straight hourly time. Employees with 4 years of service have 10 days and receive pay at the rate of 96 x straight time.

2/ Employees with 2 to 14 years of continuous service receive up to 4 weeks and are paid at the rate of one quarter of the average basic rate. Employees with 15 or more years of continuous service receive up to 2 weeks and are paid at the rate of half the average basic rate.

3/ Information not available.

4/ Shift differential refers to additional remuneration paid in cents per hour.

5/ If the employee is required to work regularly on Sundays, he is allowed another day off in lieu of Sunday.

6/ Overtime is rate of pay for work after 40 hours a week and 8 hours a day.

is based on data prepared by the industrial engineering staff. The union in its turn acts directly through its committee on wage inequities rather than indirectly through the grievance procedure. Sometimes the advice of the United Steelworkers' wage experts is also sought. Thus, both union and management handle the difficult job of dealing with ever-changing job content on a high factual level.

This is a long step forward from the old days in the steel mills, with their scattered wage rates. Today the industry has a simplified, understandable, and comprehensive wage structure based on mutual agreement. This wage structure is by no means rigid, for it serves only as a guide to the classification of particular local jobs. Nor is it a static wage structure, for the parties in their joint wage inequity committees have the means of keeping abreast of changes as they occur. The existence of a guiding wage structure and of arrangements for applying it to changing conditions is a major contribution to industrial peace.

APPENDIX I: SUPPLEMENTARY INFORMATION

Number and Concentration of Food Processing Establishments

In 1947, 2,265 establishments were engaged primarily in canning fruits and vegetables, fruit and vegetable juices (including soup), and in manufacturing preserves, jams, and jellies. These establishments employed an average of 135,974 persons for the year and packed products at $1,640,754,000.

The heaviest concentrations of establishments are in four regions. Arranged in descending order of the number of establishments in each, the regions are East North Central, South Atlantic, Pacific, and Middle Atlantic. In these four regions combined there are approximately 73 percent of all firms in the industry; in 1947, these firms packed products valued at $1,439,672,000 (approximately 88 percent of the value of the total pack). In the Pacific region, products packed in the State of California alone were valued at approximately $393,445,000, which was more than the value of the total pack of any other region.

Table Ia. General statistics for the canning and preserving industry, 1/
U. S. A., 1947
(Money figures and man-hours in thousands)

Item	1947
Number of establishments	2,265
All employees:	
Number (average for the year).	135,974
Salaries and wages (total)	$288,443
Production and related workers:	
Number (average for the year)	121,916
Man-hours (total)	243,424
Wages (total)	$234,886
Value of production	$1,640,754
Expenditures for new plant and equipment	$ 77,888

1/ Canning and Preserving (includes Standard Industrial Classification No. 2033, Canned Fruits, Vegetables, and Soups: Preserves, Jams, and Jellies, and part of No. 2015, Poultry and Small Game Dressing and Packing, Wholesale.), excludes Fish. This industry comprises establishments primarily engaged in canning fruits and vegetables, and fruit and vegetable juices (including soups), and in manufacturing preserves, jams, and jellies. Important products of the industry include canned vegetables (including canned baked beans and tomato cocktail); fruit and vegetable juices (canned, bottled, and in bulk); canned spaghetti; canned soups (except sea foods-Industry 2031); canned poultry products; canned fruits (including fruit salad and fruit cocktail); and preserves, jams, jellies, fruit butters, and maraschino cherries.

Source: United States Department of Commerce, Bureau of the Census, 1949.

Table Ib. Selected general statistics for the canning and preserving industry, 1/ by size of establishment, U. S. A., 1947

(Money figures in thousands of dollars)

Item	Number of establishments	Number of employees (average for the year)	Value added by manufacturer 2/
Total	2,265	135,974	$609,939
Establishments with an average of 1-4 employees	250	573	1,909
5-9 employees	295	2,001	6,391
10-19 employees	482	6,803	22,045
20-49 employees	607	19,158	64,962
50-99 employees	319	21,973	82,407
100-249 employees . . .	215	32,070	147,615
250-499 employees . . .	70	24,057	119,687
500-999 employees . . .	21	13,311	71,171
1000-2,499 employees .	3	3,707	15,708
2500 employees and over	3	12,321	78,044

1/ Excluding fish.

2/ Value of production, less cost of material, fuel, electricity, and contract work.

Source: United States Department of Commerce, Bureau of the Census, 1949.

Table Ic. Data on cans commonly used in canning vegetables

Can name 1/	Dimensions 2/	Capacity 3/ (ounces)	Number per case
6Z	202 x 308	6.08	48
8Z Short	211 x 300	7.93	48
8Z Tall	211 x 304	8.68	48
No. 1 (Picnic)	211 x 400	10.94	48
No. 211 Cylinder	211 x 414	13.56	48
No. 300	300 x 407	15.22	48
No. 300 Cylinder	300 x 509	19.4	48
No. 1 Tall	301 x 411	16.70	48
No. 303	303 x 406	16.88	24
No. 303 Cylinder	303 x 509	21.86	24
No. 2 Vacuum	307 x 306	14.71	24
No. 2	307 x 409	20.55	24
Jumbo	307 x 510	25.8	24
No. 2 Cylinder	307 x 512	26.4	24
No. 2-1/2	401 x 411	29.79	24
No. 3 Vacuum	404 x 307	23.9	12
No. 3 Cylinder	404 x 700	51.7	12
No. 10	603 x 700	109.43	6

1/ Names used by Committee on Simplification of Containers.

2/ The can size designation used in the industry is derived from the nominal dimensions. The first digit represents inches, the next two the extra fraction expressed as sixteenths of an inch. The diameter is cited first, followed by the height.

3/ Total capacity in avoirdupois ounces of water at 68° F.

Source: National Canners Association.

Table Id. Green pea pack by all size cases, U. S. A., 1951

Can name	Cans per case	Number of cases
Total		37,837,387
No. 2	24	1,440,041
8Z	48	3,543,741
No. 1 (Picnic)	48	1,026,942
No. 303	24	27,180,949
No. 10	6	4,474,955
Miscellaneous tin and glass . . .		170,759

Source: National Canners Association.

Table Ie. Asparagus pack by all size cases, U. S. A., 1951

Can name	Cans per case	Number of cases
Total		4,969,054
No. 2	24	1,873,376
8Z	48	280,390
No. 1 (Picnic)	48	1,250,031
No. 300 1/.	24	1,148,591
No. 303	24	25,400
No. 5	12	30,485
No. 10	6	231,058
Miscellaneous tin and glass . . .		129,723

1/ Includes some asparagus packed in 300 x 509 cans.

Source: National Canners Association.

Table If. Tomato pack by all size cases, U. S. A., 1951

Can name	Cans per case	Number of cases
Total		27,672,399
No. 2	24	13,125,598
8Z	48	150,368
No. 1 (Picnic)	48	1,035,479
No. 303	24	2,169,241
No. 2-1/2	24	5,574,873
No. 10	6	5,250,151
Miscellaneous tin and glass . . .		366,689

Source: National Canners Association.

Table Ig. Tomato pulp pack by all size cases, U. S. A., 1951

Can name	Cans per case	Number of cases
Total		5,881,030
No. 2	24	139,565
8Z	48	5,597
No. 1 (Picnic)	48	515,516
No. 2-1/2	24	835,336
No. 10	6	4,084,057
5 gallon	1	178,777
Miscellaneous tin and glass .		122,182

Source: National Canners Association.

Table 14. Tomato juice pack 1/ by all size cases, U. S. A., 1951

Can name	Cans per case	Number of cases
Total		31,625,534
Individual 5-6 oz.	48	2,916,969
8Z	48	587,661
No. 1 (Picnic)	48	19,461
No. 211 Cylinder	48	1,199,856
No. 300	48	648,845
No. 1 tall	48	292,099
No. 303 Cylinder	24	423,187
No. 2	24	6,066,927
No. 3 Cylinder	12	16,664,296
No. 10	6	1,333,920
Miscellaneous tin and glass . .		1,472,313

1/ Includes tomato juice cocktail.

Source: National Canners Association.

APPENDIX II: DATA COLLECTION

Field agents of the Bureau made personal visits to the plants covered in this report. At each plant visited the questionnaire that follows was filled out for each type vegetable processed. Actual figures from the plant's records were used and officials of the plant answered the questions.

The questionnaire was specially designed for this report. The actual questionnaire had more space allowed for the answers to questions. To conserve space in this report, the space allotted for answers is only indicated. Agents were encouraged to use additional paper to record as much information as possible.

It was not possible to get usable answers to all the questions from all the plants. All useful information received was included in this report.

B.L.S. No. 2264
In Ref. No. 801

Budget Bureau No.
Approval Expires

UNITED STATES DEPARTMENT OF LABOR
Bureau of Labor Statistics
Washington 25, D. C.

CONFIDENTIAL

PRODUCTIVITY AND FACTORY PERFORMANCE

PROCESSED FOODS

Plant name ______ Address ______
Parent Company ______ Address ______
Name of officials interviewed: (Cross out "Co." or "Plant")
(Co.) (Plant) ______ Title ______
(Co.) (Plant) ______ Title ______
(Co.) (Plant) ______ Title ______

The data submitted on this schedule will be seen only by sworn employees of the Bureau of Labor Statistics. The data will not be available in any form which permits identification with any specific company, without written permission.

Survey made by ______ Date ______

PART I. REPORTED PRODUCT DATA

A. SPECIFICATIONS

1. Reported product:
   a. Enter the name and description of reported product ______
   b. Type of container: Can ____ Glass ____ Size ____ Number per case ____
2. Reported period:
   Select a one-week period in which production of the reported product was at a high level. Period begins ______ and ends ______

B. PRODUCTION AND MAN-HOURS

1. Total production during reported period of reported product ______ dozens of cans (or glasses) (Specify if other unit)
2. Man-hours:
   a. Actual factory man-hours on reported production during the reported period: Total ______ Direct ______ Indirect ______
   b. List the labor accounts included in the above direct and indirect man-hour figures.

Direct Labor Accounts	Hours	Indirect Labor Accounts	Hours

   c. Describe the source and procedure whereby the preceding man-hour figures were obtained. ______

C. FACTORY OPERATIONS AND MACHINERY FOR REPORTED PRODUCT

1. Operations and machinery for reported production (B1) during reported period (A2):

Enter the data indicated below in the operational sequence of the flow of production. Include steps for material movements and inspection.

Operations and Brief Description	Actual Man-hours		No. of Workers	Equipment					Other Products Run on This Machine
	Direct	Indirect		Name, Make, and Model of Machine	No. of Units	Age (Yrs.)		Capacity	
						Av	Range		
Receiving:									
Preparation:									
Mfgr. Processing:									
Filling:									
Sealing:									
Thermal Processing:									
Cooling:									
Labeling:									
Casing:									
Total				XXX	X	X	X	X	XXX

2. Man-hours and use of machinery:
   a. State reasons for any differences between total man-hours by operations and total man-hours in question B2a ____________
   b. Describe the method used to obtain the man-hours above ____________
   c. Name the months of the year that any of the above machinery stands idle ____________
   d. In thermal processing, state for the reported product: Pressure ____________
      Temperature (degrees F.) ____________ Cooking time ____________

3. Materials handling for reported product: General description (for aspects not covered in Part IC): __________

D. PRODUCTION SCHEDULING AND CONTROL

1. Production scheduling:

   a. Approximate time required to attain line capacity (Time from the beginning of the first operation through thermal processing)_____

   b. Describe extent and frequency of interruptions to production of reported product due to normal repairs and cleaning of machinery____

2. Production control:

   Briefly describe how production is planned, scheduled and controlled. (This includes all methods and procedures used to insure continuous and efficient operations to attain optimum production per man-hour.) Secure illustrative material such as scheduling forms, operations, tickets, etc.__________

3. Plant layout: Briefly describe. (Obtain diagram if possible)________

4. Describe any major changes that have been made in equipment for reported product since 1945-6__________

5. Inspection of reported product:

   a. Does this plant have a statistical quality control system? Yes ___ No____. If yes, describe__________

   b. Other types of inspection systems: Describe__________

   c. Rejects: Percent of total production________. Describe procedure for handling rejects__________

Inventory practices:

If plant has refrigerator storage facilities for raw materials used to produce the reported product indicate the following:

a. Size in cubic feet__________

b. Stock of raw materials for how many days of production is kept on hand__________?

PART II. GENERAL DATA

A. PLANT INFORMATION

1. Size of firms:

   a. Total number of different products produced in this plant during the past year _____ (Do not include size or style variations of the same product in this number)

   b. Number of separate plants directly operated by this company______

2. Plant buildings

Name and Use of Building	Sq. ft. by Floor 1	2	3	Age	Type of Constructions and Special Features

3. Engineering and research:

a. Check whether this plant has a special department to conduct research for improvement of the following and if so, enter the number employed in each.

	Yes	No	No. employed
(1) Plant layout			
(2) Production methods			
(3) Cost analysis			
(4) Product improvement			

b. If yes, briefly describe the nature of their activities, and illustrate how they have affected unit man-hours during the last five years ____________

c. If no, are these services obtained from outside sources? Yes ______ No ____________. If yes describe ____________

4. Describe other factors or developments which contributed to increased productivity in this plant during the past five years ____________

5. Employment in the entire plant during the reported period (IA 2):

Type of Labor	No:	Type of Labor	No.
a. Total plant employment		c. Factory indirect labor	
b. Factory direct labor (Specify labor accounts)		(1) Foremen (Foreladies)	
(1)		(2) Maintenance men	
(2)		(3) Watchmen	
(3)		(4) Other (specify)	
(4)		(5)	
(5)		(6)	
(6)		(7)	
(7)		Total indirect labor	
Total direct labor		d. Office employees	

BLS Report No. 9

Industry Reports: GENERAL EXPLANATIONS

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The 1947 Interindustry Relations Study

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

The 1947 Interindustry Relations Study

The Study of Interindustry Relations for 1947 is a comprehensive analysis of the transactions relationships among the separate industries of the United States in that year. For purposes of this study, the United States economy was subdivided into about 500 separate sectors or activities, the majority of which correspond with conventional industry classifications. A detailed statistical analysis was carried out for each sector of the purchases from and sales to all sectors in 1947, and the results were reconciled within a general framework of national production and consumption data.

This study was made as a part of a continuing interagency program directed primarily toward the improvement of industrial mobilization analysis. It was financed jointly by the United States Air Force, the National Security Resources Board, and the United States Department of Labor.The study was carried on for several years by the Division of Interindustry Economics of the Bureau of Labor Statistics, U. S. Department of Labor, under the general direction of W. Duane Evans, Chief of the Division, and Marvin Hoffenberg, Assistant Chief. Jack Alterman, Sidney A. Jaffe, Philip M. Ritz, and (for a shorter period) Sam H. Schurr were responsible for major parts of the study. Important contributions were made by many members of the staff.

The funds assigned to this project were intended to provide information needed for industrial mobilization applications. However,because the methodology and results of the study are of wider interest, the Bureau of Labor Statistics is undertaking with limited resources some documentation of the study for general use.

These plans include general statements on concepts and procedures applicable to the entire study; methodological reports referring to major economic areas such as manufacturing, mining, and agriculture; and detailed reports for specific sectors or industries giving the basic statistical findings of the study.

The accompanying report describes the concepts and procedures generally applicable to all areas encompassed by the study and includes a description of data sources and estimating techniques common to a majority of the sectors.

Industry Reports:

GENERAL EXPLANATIONS

The 1947 Interindustry Relations Study

UNITED STATES DEPARTMENT OF LABOR
Martin P. Durkin - Secretary

BUREAU OF LABOR STATISTICS
Ewan Clague - Commissioner

Washington 25, D. C.
March 1953

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The detail of the BLS interindustry classification by relationship with the Census of Manufactures and with the Standard Industrial Classification has been published by the Bureau of Labor Statistics and is available upon request. This classification listing includes related material which indicates salient control totals, gives brief industry definitions, shows type of source material used, and briefly compares totals for manufacturing industries with those in the 1947 Census of Manufactures.

Explanation of Basic BLS Concepts

Valuation of Production

The 1947 study concerned itself with "real" flows of goods and services. Money flows, e.g., transfer of money for financial claims or for previously existing assets, were excluded. However, monetary values were used in the study to measure production and its allocations to users. Dollar estimates may be given physical significance by regarding them as representative of the physical amounts transacted in 1947 valued at the average prices prevailing during the year.

Production may be measured in terms of either producer's value or purchaser's value. Between the two lie such margin or spread items as rail, inland water, truck, air and pipeline transportation costs; warehousing and storage charges; wholesale and retail trade margins; and Federal and State and local government excise taxes. These items were specifically identified in the industry analyses, in which source materials were assembled and estimates made in terms of both producer's and purchaser's values.

Current and Capital Account Transactions

A complete accounting of an industry's transactions would record both current account and capital outlays. If such an accounting procedure were followed in an interindustry relations study, gross investment expenditures would be reflected in each industry's cost structure and consequently appear in its input coefficients. However, as there is no a priori reason to expect stability (in the sense of a proportionate relationship) between output and investment, input ratios which included capital outlays would not have served the primary purpose of the 1947 study; namely, the determination of structural relationships between industries. Therefore, transactions among the processing sectors of the economy were limited only to current account flows.

An analysis of capital transactions was necessary, however, because all productive activities were encompassed in the study. Capital outlays were handled by simply aggregating them in the relevant final demand segment of the economy, usually gross private capital formation. In some instances, items which were capital goods in nature were allocated to other final purchasers, such as government and foreign trade (exports).

Secondary Products

The type of data available on manufacturing industries from the Census of Manufactures made it necessary to adhere to an industrial classification based upon establishment units. The fact that a single establishment may have produced a wide variety of products complicated this type of classification for interindustry purposes. Each establishment was classified in the industry where its principal commodities were primary by definition. However, an establishment could have produced "secondary" commodities that were outside the commodity scope of the industry in which it was classified.

Conceptually, there was no reason why secondary products could not have been allocated from producing industries and charged to consuming industries in the same way as primary products of the same establishments. However, this would have been operationally difficult, because much of the information describing the cost structure of industries and transactions between sectors was based on commodity use, and not on the industry classification of producing establishments. In translating such commodity information on costs of a particular industry to a classification by producing industries, no determination could be made of the amount obtained from the industry where the commodity was a primary product and the amount obtained as secondary products from other industries. An arbitrary pro rata division by means of the amounts produced in each industry would have been extremely time-consuming. Therefore, all products of the same kind were considered as comprising one common pool from which allocations to industries consuming that product could be made. (The transfer device by which this was accomplished is explained later.)

Dummy Industries

The basic study tabulations included several dummy industries which were set up to account for groups of commodities supplied from a wide variety of sources and shipped to numerous destination industries. The advantage of establishing such sectors can best be described by citing an example. One of the dummy industries was "Motor Vehicle Replacement Parts." In many instances the volume of purchases of such replacement parts by an industry could be identified but no information was available on purchases of specific commodities in these categories. From the analysis of the industries producing such commodities it was possible to designate the items which would generally fall in the category. First, the commodities which could be directly charged to consuming industries were treated as direct allocations. The balance for each producing sector was then allocated in a transfer sense to the dummy "Motor Vehicle Replacement Parts" sector, from which it was charged to consuming industries as aggregates. This procedure was utilized also for "Waste Materials, Metal" and "Waste Materials, Nonmetal."

Transfers

In order to handle secondary products and competitive imports (explained later) and certain other transactions, such as those concerned with dummy industries, it was necessary to establish certain artificial or indirect allocations, called "transfers." A "transfer" is an indirect allocation in the sense that a transaction amount is arbitrarily shifted from one sector to another so that distribution to the actual user will take place from the latter sector. In general, a transfer is a device for simplifying allocation procedures. With respect to domestic production, transfers may apply to more than secondary products, although the usage is often synonymous.

The Tables of an Industry Report

Every report for an intermediate industry includes the three basic tables described below. 3/ Some reports, particularly those for service industries, include additional auxiliary tables which contain information used in developing some of the data in the basic tables.

Table I--Summary of Transactions--is designed to show the development of the gross output and the equivalent gross input totals for an industry and their relationship to some of the significant components. The primary breakdowns shown on both the input and output sides are between components dealing with the basic or primary industry, such as "total inputs to primary industry" and "total production of primary industry," and "transfers-in." Each of these subtotals is further broken down into its significant components. Thus, on the input side, the "total inputs to primary industry" is broken down into "cost of materials, supplies, etc." and "nonmaterial charges," and the "transfers-in" are divided into "domestic" and "competitive imports." On the output side, "total production of the primary industry" is separated into shipments of products directly allocated to consuming industries, shipments of products which are transferred to other industries for distribution, and inventory change of the primary industry; transfers-in are not further broken down, because all the detail is shown on the input side.

Table II--Inputs to Primary Industry--gives the industrial distribution of inputs relating only to the primary industry. These industrial distributions, shown both in producer's and purchaser's values, are classified as follows: (1) cost of materials, parts, containers, and supplies; (2) cost of fuels and purchased electric energy; (3) purchased contract and commission work; (4) marketing charges on material purchases (these apply only to the column showing industrial distributions in producer's value); (5) purchased services; and (6) factor payments and other charges.

3/ The reports for the autonomous sectors, however, may differ somewhat. The construction reports, for example, contain only input tables.

Table III--Outputs--gives the industrial distribution of all shipments 4/ of an industry, including also inventory depletions of products primary to the producing industry held both by the producing industry and elsewhere. The plan of table III is to show separately direct distribution of primary shipments or receipts, direct distribution of miscellaneous receipts, and indirect distribution of secondary products and other receipts which have been transferred to other industries for distribution.

Section A of table III deals with the development of the control total for primary product shipments. Such total consists generally of three components: (1) primary product shipments of the primary industry, including inventory depletions, if any; (2) transfers-in; and (3) inventory depletions of products primary to the industry under consideration but held elsewhere. It will be noted that the first two components appear in table I; the third component does not because it is not part of gross output. It must be estimated separately for table III, however, because inventory depletions enter into product distributions that determine the inputs to receiving industries. Similarly, the inventory increase, if any, of the producing industry is not included in the primary products shipments control total because it does not enter into the distributions to consuming sectors shown in table III. However, it is shown as a component of the distribution to the inventory sector in a transactions table of an interindustry relations presentation.

Section B of table III gives the marketing charges, by type of charge, that apply to the primary product shipments. The total of such marketing charges added to the total of primary product shipments of section A yield the purchaser's value of such shipments.

Section C of table III presents the industrial distribution of the primary product shipments, both in producer's and purchaser's values. Each industrial distribution

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4/ Shipments apply to commodity-producing industries. For noncommodity-producing industries the concept of receipts is generally applicable.

is shown in as much product detail as possible and subtotals are given for final demand allocations as distinguished from intermediate allocations.

Section D of table III shows the industrial distribution of the miscellaneous receipts, if any, which are directly allocated. Distributions are shown separately for each item. In most instances these items remained unallocated because of the difficulty of identifying either the item or the purchaser.

Section E of table III provides the distribution of the transfers-out which, in most cases, involve secondary products, scrap and salable refuse, and surplus electric energy.

The primary product shipments appendix to table III consists of two parts. Part A gives a detailed breakdown of the primary products shipments control total as developed in section A of table III, with indications as to the source of such product, i.e., domestic production, competitive imports, or inventory depletions. Part B gives an industrial distribution for each product and represents a rearrangement on a product basis of the distribution in section C of table III. Frequently, products could not be completely distributed as such, because distributions to some sectors could not be identified in detail. In such cases, the residuals of all such products of an industry were distributed together as one product.

Explanation of BLS Statistical Measures

The various types of statistical measures differentiated in the industry estimates are explained here. Their definitions reflect to some extent compromises made between the conceptually desirable and the practically possible under a given classification system and with available data.

Industry Gross Output on an Establishment Basis

Gross output of an industry classified on an establishment basis was defined for interindustry study purposes as a composite of the following items:

1. Total current production of establishments primarily engaged in the manufacture of a given product or products or the provision of a given service. This total includes the manufacture of not only primary products but also secondary products of the industry and receipts from other activities such as contract and commission work, electric energy and scrap produced and sold, and various nonmanufacturing operations.

2. Transfers-in of primary products or activities from elsewhere.

    a. Secondary production of the given products (or services) currently produced in other domestic industries.

    b. Imports for consumption during 1947 of the given products (or services), including shipments from noncontiguous territories of the United States.

If, as in some industries, primary product shipments (discussed on p. 13) exceeded primary industry production in 1947, then gross output (before transfers-in) was less than shipments by the amount of inventory depletions of finished product within the producing industry. When inventories of finished product increased within the producing industry, shipments were less than this primary industry production component of gross output.

The inclusion of items 2a and 2b in gross output arose from the operational difficulty of allocating separately a product from both its primary industries and from other industries or from abroad. For study purposes, therefore, the supply of the product, no matter where produced, was considered as a meaningful aggregate from which allocations to industries consuming this product could be made directly. This was handled operationally as "transfers-in" to the BLS industry of imports and secondary manufacture of the products in other domestic industries. As indicated above in the general discussion of "transfers," part of the primary production of an industry could sometimes be transferred also. This was specifically true in a few cases where a primary product of an industry was identical with or very similar to a primary product of another industry.

For the same reason, secondary products of the primary industry were "transferred-out" to respective primary industries. Thus, for example, toilet preparations manufactured by the drugs and medicines industry were treated as a "sale" to the toilet preparations industry, with subsequent sales by that industry to consumers.

Scrap and electric energy produced and sold by an industry were similarly transferred-out to their respective primary industries. However, other miscellaneous receipts, such as for contract and commission work, were directly allocated or left undistributed.

Industry Gross Output on an Activity Basis

Gross output of an industry classified on an activity basis was measured in terms of either gross receipts or margins. Any competitive imports were included in gross output and were handled by the same transfer device described above. However, the treatment differed for secondary revenues of activity-type industries for which source data were on an establishment basis. For example, gross output of trade establishments was measured both inclusive of trade functions performed by service establishments and exclusive of service functions performed in trade establishments. This procedure may appear on the surface the same as that described for gross output on an establishment basis, but the two differ materially. In the establishment case, secondary products were allowed to remain in the gross output of the industry of origin but were also distributed in the form of a "sale" to the industry where such products were defined as primary production. In the activity case, the transfer device was rarely used for secondary revenues. Alternatively, the procedure generally adopted was to include all of the primary activity, no matter where originating, and to exclude other activities of the establishments primarily engaged in the activity. However, under unique circumstances, the transfer device was used in a few instances for some activity-type industries.

Industry Gross Output on a Product Basis

Gross output of an industry classified on a product basis was measured in terms of annual physical production valued at average yearly unit prices. Competitive imports were included here also by means of the transfer device. Transfer of secondary production was not required except in a few product-type industries.

Shipments of Primary Products

Shipments of primary products in 1947 included those of domestic and foreign origin described above, and, in addition, depletions during 1947 of inventories held outside of the producing industry. Inventory depletions outside the producing industry, although a component of primary product shipments, were not part of the gross output of the producing industry. Inventory depletions within the producing industry were, as described earlier, part of primary product shipments of the primary industry, but they also did not enter gross output. Inventory depletions were nonexistent in industries classified on an activity-basis.

Primary product shipments or primary revenues were distributed to final demand sectors (for final or ultimate consumption) and/or to processing industries (for intermediate use in producing products or services which are sold directly to final users or ultimately become incorporated in products or services which are sold to such users).

Final demand allocations included goods and services for household consumption; both current account goods and services and producers' durable equipment purchased for governmental use; and similar items to the foreign trade sector as exports. Also included were producers' durable equipment and certain other capital goods items for non-governmental domestic use which were allocated directly from the producing industry to the gross private capital formation sector rather than to individual industries. Similarly, new construction activity was carried on, not by the actual contracting industries, but by a number of construction sectors handling the entire activity of new construction. New construction was allocated to capital formation and to government in the same manner as producer's durable equipment. Maintenance construction also was treated as an activity (or a group of several), but was allocated as a current account cost. Purchases of building materials and various services for construction purposes thus became inputs to the construction sectors. Shipments of goods to all sectors implied consumption or use during 1947; goods purchased and not used, and which eventually became part of additions to stocks, were considered final products allocated to the inventory change sector. (See detailed discussion of final demand sectors on p. 17.)

A common intermediate allocation needing special mention is the so-called "intra-industry" shipment. In most cases this represented the value of real sales (or interplant transfers) of primary products or services among establishments within the industry. Primary products of the industry consumed within the establishments where produced were generally excluded. In general, only transactions clearly representing the movement of goods from one production stage to another were included. This was true whether the transactions were intraindustry or were not.

Marketing Charges on Primary Product Shipments

Shipments of primary products incur marketing charges in their delivery to the consumer. These were defined, for study purposes, as the value (such as freight costs, trade margins, and excise taxes) added to commodities during the distribution process. Inasmuch as commodities were allocated directly from industry of origin to industry of destination, they were not charged to the distributive industries unless actually used by them. Products charged directly to distributive industries were those consumed in the operation of their productive activity, e.g., gasoline purchased for use by the trucking industry in transporting goods as contrasted with the value of the gasoline carried as freight or the charge for carrying it.

Gross Input

The gross input of the producing industry in 1947 was valued, by definition, at the same level as gross output and covered all costs consistent with that definition of gross output. More specifically, the gross input total included:

1. Input requirements for total production of establishments in the primary industry. These comprised the cost of materials, parts, containers, and supplies; the cost of fuels and purchased electric energy; purchased contract and commission work; marketing charges on material purchases; service charges; and, finally, factor payments and other charges;

2. Secondary production of primary products or services produced elsewhere;

3. Foreign production of primary products or services (competitive imports) imported in 1947.

Secondary production and imports (2 and 3 above) were "transfers-in" to the primary industry and were included in both gross input and gross output in order to maintain equality between the two measures. On the output side, "transfers-in" may be considered as part of the common pool of primary products in 1947 (as already mentioned) from which allocations to consuming industries were made. On the input side, "transfers-in" may be viewed as secondary production and import requirements of primary products necessary to have satisfied total demand for those products in 1947.

Cost of Materials, Parts, Containers, and Supplies. These costs were defined to include the value of material items other than fuels actually consumed during 1947 which were either purchased from current production, withdrawn from inventories, or imported and had no domestic counterpart. These latter inputs were defined as noncompetitive in nature; competitive imports were purchased from the counterpart domestic industry (see discussion on p. 23).

Cost of Fuels and Purchased Electric Energy. These were material purchases not incorporated within the products of an industry. However, fuels may have been consumed as either embodied or nonembodied commodities, but only the latter appeared in this category. For example, coal used to make coke differs conceptually from coal used as fuel and appeared as a material cost rather than as a fuel.

Purchased electric energy did not cover total electric energy consumed by an industry because electric energy produced and consumed within the industry was not measured.

Contract and Commission Work. These costs referred to payments by an industry for processing operations performed on their materials, the title to which remained with the industry. Cost of contract and commission work did not include such costs as maintenance and repair and new construction performed on a contract basis for the establishment.

Marketing Charges on Material Inputs. These charges were similar in concept to those on output shipments described earlier. The charges assigned represented the total of each of such charges associated with the purchase of all material inputs.

Service Charges. These were payments to intermediate service industries other than those engaged in distributive operations. Excise taxes (marketing charges) were included in the purchaser's values of the few purchased services to which they applied.

Factor Payments and Other Charges. These were applicable to the producing industry and were characteristically of two kinds:

1. Payments to households. In a broad sense these encompassed net incomes accruing to entrepreneurs, corporations (after taxes), investors, etc. Payments included wages and salaries, proprietors' income, corporate profits after taxes, interest, etc. Depreciation and other capital consumption allowances were also included in this category as were a number of minor items not readily classifiable by purchasing sector.

2. Tax payments to government, excluding both excise taxes incurred in the purchase of material and service inputs and customs duties paid on imports.

Explanation of Final Demand Sectors

The designation of both end-product deliveries to final demand and the sectors which receive (or purchase) these items is essentially arbitrary. The names of the sectors and the working rules which determine their allocations, either as a purchaser of inputs or a seller of outputs, are to a great extent the result of an attempt to keep the accounts similar to the national income and product accounts of the U. S. Department of Commerce. 5/ The exact definitions and the fine detail of the allocations are, however, the result of operational requirements of the interindustry relations system. Frequently the classification system and exact definitions will be changed to fit an analytic framework consistent with a particular problem under consideration. In general, however, the interindustry system as most usually presented has the final demand sectors indicated in these reports. For purposes of consistent presentation and analytic application of the interindustry relations system, both the 1947 final product allocations to final demand and conversely the inputs originating from these sectors (charges against final demand or product) are important and appear in each industry study. It is evident that much of the input detail has been condensed from that which was initially gathered. The special characteristics of the final demand sectors are explained in the following paragraphs. Not all the items mentioned will appear in each report.

Households

Purchases by households included personal consumption expenditures and direct personal taxes. Also included were expenditures by farm households for personal living requirements. Thus, food and a few other items produced and consumed on farms were included, but items entering as costs of farm operation were not. Household purchases of dwelling units for own occupancy were not included in this sector but were considered to be investment expenditures and included in gross private capital formation. Some expenditures by individuals in connection with

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5/ To the extent that final demand sectors are similar to the Gross National Product (GNP) categories of the Commerce Department, so are the intermediate sectors of the interindustry relations systems similar to those which have been excluded (netted out) from the GNP accounts.

business activities were included, such as hand tools purchased by carpenters. Travel and entertainment expenses of individuals related to business activities for the most part were included in this sector.

Material purchases by households were expressed in both producer's and purchaser's values, i.e., both exclusive and inclusive of marketing charges. Transportation costs, trade margins, and excise taxes related to such purchases were also shown separately as individual aggregates purchased directly by households from the respective distributive industries. Household purchases of second-hand items were accounted for only to the extent of the gross trade margins involved. Sales taxes were treated in the same way as excise taxes, i.e., as household payments to a government sector. The exception was sales taxes reported as part of operating costs in trade. These were shown as tax payments by trade itself and were counterbalanced by increasing household payments to trade by an equivalent amount.

Rental payments by households covered both rents paid by tenants and imputed rents of home owners. The rental concept employed here was the "space rent" used by the Department of Commerce in its consumption expenditures estimate. Under this concept household outlays for fuel and power were shown as direct payments to the fuel and power industries rather than part of rents. 6/

Practically all maintenance of residential buildings was charged as a cost to the rental industry rather than to households. Nevertheless a small amount of maintenance was charged to households, representing maintenance outlays paid by tenants themselves.

Receipts of households represented, for study purposes, all incomes accruing to final demand sectors except receipts accruing to foreign trade for imports, and tax receipts accruing to government.

6/ The 50-sector interindustry relations tables, presented in October 1951, and the 200-sector tables, presented in October 1952, were somewhat different in this regard. In these tables rental payments by households included all utility costs as well as "space rent."

Receipts of households may be segregated into factor and nonfactor payments. Factor payments consisted of wages and salaries, employer contributions to private pension plans, royalties, interest, entrepreneurial income, and corporate profits (after taxes). Nonfactor payments consisted of such items as transfer payments (including contributions and gifts), depreciation and amortization, capital outlays charged to current expense, losses and accidental damage to fixed capital (uninsured), business travel and entertainment (including reimbursement for personal car use), banking service cash charges to business, and claim payments (primarily nonlife insurance). There were a few other minor items which differentiate the household account from factor payments in the national income sense.

Government

This area was divided into two separate sectors, Federal Government and State and local government. Federal Government covered the general activities of government related to the domestic economy as well as foreign countries, and included many financial activities of such government corporations as Commodity Credit Corporation, Reconstruction Finance Corporation, and the Federal Deposit Insurance Corporation. However, industrial activities of government corporations were excluded from the government sectors and were included in the related intermediate industries. These included operations of the TVA fertilizer plant, RFC tin smelting and synthetic rubber plants, the Government Printing Office, and other diverse operations. The State and local government sector included all local bodies - States, cities, counties, townships, and special districts (except school districts which were covered in the education industry).

Government receipts represented all tax and nontax revenues on current account. Corporate income taxes were estimated on an accrual basis and other tax receipts on a collection basis. Corporate income tax receipts were allocated to the industry legally liable for payment except for the prorated tax liability from interest income, which was allocated to households.

Excise taxes, including general sales taxes were handled as marketing charges, i.e., such taxes were allocated to industries purchasing taxed goods or services rather than to industries legally responsible for payment.

Customs duties associated with competitive imports were allocated to the comparable domestic producing industry, and the few customs duties associated with noncompetitive imports were allocated directly to using industries. This treatment of duties was consistent with the competitive and noncompetitive import allocation procedures discussed for the foreign trade sector.

Government purchases of goods and services included capital goods and transfer payments. All public new and maintenance construction (including force account) were considered as purchases from the construction sector rather than as purchases of construction materials, services, and other cost items pertaining to such construction activity. Similarly, government expenditures for health and education were treated as purchases from the hospital and education industries rather than as purchases of individual items pertaining to such activities. However, purchases of capital equipment for use in public construction, hospitals, education, and related public fields were charged directly to the government sectors.

Government interest payments (except payments to social insurance funds) and unilaterals were treated on a net basis. Government payments to social insurance funds and contributions to such funds are real costs to government for services rendered and were consequently treated as intragovernment transactions. Intragovernment transactions also include payments of one government sector to another, such as, Federal grants-in-aid to the States.

Gross Private Capital Formation

Purchases by the capital sector were for goods and services charged by business to capital account. Generally, such purchases consisted of new plant and equipment. However, other costs of acquiring capital assets, wherever identified, were also charged to this sector.

Outlays for new private construction were shown as flows from the construction sectors to this sector. (See construction sector for more detail.) Outlays for equipment comprised most of the other expenditures by the capital sector. The capital sector was extended for study purposes to include: (1) Expenditures for labor charged to capital account (if readily identifiable, as installation of telephone equipment); (2) payments to title abstract companies; (3) commissions on transfers of real property; (4) architectural and engineering fees not included in current construction costs; (5) margins on sales of second-hand producers' durable equipment; (6) value of work performed in motion-picture production; and (7) selected minor items normally capitalized by an industry.

Receipts of the capital sector were defined conceptually as capital consumption by business and measured in terms of depreciation and other capital consumption allowances. However, such measurements were not readily available for individual industries, and hence no attempt was made to estimate such charges. Consequently, such items as depreciation were included as part of a residual category in the household sector. (See household sector detail on p. 17.)

New and Maintenance Construction

These types of construction represented for study purposes all construction activity in the economy. All material and nonmaterial purchases required for either new or maintenance construction were charged as inputs to the construction sector. For example, purchase of steel rails was a charge to construction rather than to the railroad industry. No distinction was made between force account and contract construction. Oil and gas well drilling costs were included as part of construction expenditures.

The sector's output was the value of all new and maintenance construction put-in-place during 1947 by private and public enterprise. New private construction was allocated to gross private capital formation. New and maintenance public construction flowed to the government sectors. Private maintenance construction was distributed to most sectors of the economy.

Inventory Change

Inventory change represented the sector to which all stock additions in the economy during 1947 were sold and from which all stock depletions were purchased. In this study inventory change was measured only when it referred to finished products (as distinguished from materials in process). Raw materials in the stocks of a purchasing sector were included insofar as they contributed to inventory change outside the producing industry. Additions and depletions were differentiated between those arising within and outside of a producing sector. Inventory values shown for the producing industry were on a net basis for a given product or product group; i.e., for a producing industry there were either additions or depletions but not both. Inventory values outside the producing industry were on a gross basis in the sense that several outside sectors were recognized; i.e., for a product or product group there could be a depletion for some sector (e.g., trade) and additions for others (e.g., government).

The above information on inventory change describes the treatment in the output table of an industry report (table III and Appendices). In an interindustry relations table, however, there are normally some differences in handling. For example, all inventory change within a producing industry is netted, so that product detail is in effect eliminated. Other differences relate mostly to the fact that an industry output table (such as table III) must account for the supply of each product available for distribution, whereas an interindustry transactions table is concerned mainly with current production. Such a transactions table may include various devices for recording depletions or additions outside the producing industry but they clearly do not enter gross output even though they form a part of available supply.

In the output tables of an industry report, inventory additions (net) within a producing industry do not appear explicitly as part of primary product shipments; but the production which led to these increases in inventory is part of gross output (as shown in table I). Inventory depletions within a producing industry are not shown explicitly in the output tables either, but they do appear as part of primary product shipments. They appear also in table I. The output tables do show inventory depletions and inventory additions outside the producing industry. The former appears in the build-up of the supply of the producing industry's products and the latter appears in the distribution of that supply.

Inventory data underlying the estimates were expressed, for the most part, in terms of book value. Few adjustments of these book values to average yearly values were made except in the fields of agriculture and trade. For these areas the estimates were generally revalued to place all inventory changes in terms of 1947 average prices.

Foreign Trade

Foreign trade was defined as a sector representing the sum total of all economies outside the continental United States. Foreign trade's purchases were therefore identical with exports of United States merchandise plus shipments to noncontiguous territories; its receipts were identical with United States imports for consumption plus shipments from the territories.

Generally, foreign trade transactions were limited to the purchase and sale of goods and services. Capital money flows and changes in gold stock were eliminated. Exports of used items were similarly eliminated except for distributive charges incurred in selling and transporting them to the port of exportation. Imported used items, however, were included because such products were in effect "new" to the United States economy - the question of current productive activity being completely irrelevant in this case. Foreign trade also included (net) unilateral transactions for which there were no tangible compensations.

For study purposes, foreign trade's output was classified into two general categories - competitive and noncompetitive imports. Competitive imports were defined to include imported products or services similar in nature and/or highly substitutable for products or services produced commercially in continental United States. Noncompetitive imports comprised those products or services without similar or closely substitutable domestic production. Competitive imports included such items as natural rubber and bananas; the former was substitutable for synthetic rubber and the latter for domestic fruit. Examples of noncompetitive imports included green coffee beans, cacao beans, tea, jute burlap, and manila hemp. In addition, noncompetitives were defined to include net private and net Government unilaterals abroad, U. S. personal expenditures abroad, and payments (principally by Government and the ocean transportation industry) for goods and services received abroad.

Competitive and noncompetitive imports were subjected to different allocation procedures. Competitive imports were transferred to domestic industries producing comparable primary products, from which they were allocated to industries using them in their production process. Noncompetitive imports were simply distributed directly to consuming sectors.

BLS Report No. 10

Industry Reports:

MANUFACTURING METHODOLOGY

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The 1947 Interindustry Relations Study

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

The 1947 Interindustry Relations Study

The Study of Interindustry Relations for 1947 is a comprehensive analysis of the transactions relationships among the separate industries of the United States in that year. For purposes of this study, the United States economy was subdivided into about 500 separate sectors or activities, the majority of which correspond with conventional industry classifications. A detailed statistical analysis was carried out for each sector of the purchases from and sales to all sectors in 1947, and the results were reconciled within a general framework of national production and consumption data.

This study was made as a part of a continuing interagency program directed primarily toward the improvement of industrial mobilization analysis. It was financed jointly by the United States Air Force, the National Security Resources Board, and the United States Department of Labor.The study was carried on for several years by the Division of Interindustry Economics of the Bureau of Labor Statistics, U. S. Department of Labor, under the general direction of W. Duane Evans, Chief of the Division, and Marvin Hoffenberg, Assistant Chief. Jack Alterman, Sidney A. Jaffe, Philip M. Ritz, and (for a shorter period) Sam H. Schurr were responsible for major parts of the study. Important contributions were made by many members of the staff.

The funds assigned to this project were intended to provide information needed for industrial mobilization applications. However,because the methodology and results of the study are of wider interest, the Bureau of Labor Statistics is undertaking with limited resources some documentation of the study for general use.

These plans include general statements on concepts and procedures applicable to the entire study; methodological reports referring to major economic areas such as manufacturing, mining, and agriculture; and detailed reports for specific sectors or industries giving the basic statistical findings of the study.

The accompanying report describes the study concepts and methodological procedures generally applicable to all the manufacturing sectors in the 1947 Interindustry Relations Study. This report and an earlier one (BLS Report No.9) discussing the concepts and procedures generally applicable to the study as a whole are designed to accompany each of the detailed sector reports in the manufacturing area.

BLS Report No. 10

Industry Reports:
MANUFACTURING METHODOLOGY

The 1947 Interindustry Relations Study

UNITED STATES DEPARTMENT OF LABOR
Martin P. Durkin - Secretary

BUREAU OF LABOR STATISTICS
Ewan Clague - Commissioner

Washington 25, D. C.
March 1953

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Secondary products, the important consideration, could have been distributed to consuming industries in several ways. In one method, the secondary products could be distributed directly from the producing to the consuming industries. There were two difficulties with this procedure. First, the detailed product information given in the 1947 Census of Manufactures (Standard Table VI, Vol. II) covered shipments of primary products wherever made with no information on producing industry. The information given for the producing industry (Standard Table V, Vol. II) is in consolidated form and not sufficiently detailed for distribution purposes. Secondly, most of the information available on distributions was in terms of products rather than industries. This method was, therefore, rejected.

A second method which was considered involved the exclusion from an industry's output of all secondary products produced in that industry and the inclusion of all products primary to the industry wherever made. The difficulty with this method was that it meant a redefinition of the industry from an establishment to a commodity basis. This might have been analytically desirable, but practically all available statistical sources were based on establishment definitions like those in the Standard Industrial Classification. This would have created problems in the use of these sources both for the 1947 Interindustry Relations Study and for future modifications and analysis. For instance, the input information published in the 1947 Census of Manufactures for each industry would have required the difficult task of adjustment to exclude inputs relating to the manufacture of secondary products. This method also was rejected.

A compromise between the first two methods was adopted finally. Secondary products were retained as part of the output of the producing industry, thus avoiding the necessity of making corresponding adjustments in the input control totals published in the 1947 Census of Manufactures. However, they were not distributed directly from the producing industries to the consuming industries. Rather, they were "transferred," in the sense of "fictitious sales," to the industries of primary production to be distributed together with the primary outputs of those industries. Thus, the total supply of a commodity was to be distributed from one source, the industry of primary production.

Consequently, the output figure for an industry was modified to include, in addition to its own production of primary and secondary products (and certain miscellaneous receipts), the value of products primary to it but made elsewhere as a secondary product. This increment to output was called a "domestic transfer-in." In some instances there were transfers-in of domestically produced products that were considered primary products in both the industry where produced and the industry to which transferred. These usually occurred when two or more industries produced one or more similar primary products which were more readily distributable from one industry.

A further modification of output occurred whenever imported commodities were identical with or closely substitutable for the primary products of an industry. These "competitive imports" were also transferred-in to the primary industry in much the same sense as domestic transfers-in. The entire supply of primary products was then distributed directly to consuming industries. At the same time the products which were not distributed directly (secondary products and others transferred-out) became indirect allocations to other industries.

Thus, the gross output of an industry included the primary industry's production and the sum of all transfers-in, whether domestic or foreign in origin. In order to balance an industry's inputs with its gross output, as now defined, it was necessary to add these transfers-in to the input side as well.

A basic industry as an aggregate of Census industries

A number of manufacturing industries in the Interindustry Relations Study were composites of individual *Census of Manufactures* industries. Usually, such aggregations were made where either input or output distribution information was more readily available for the aggregation than for the individual component industries or where industrial integration made interindustry transactions among the aggregate essentially meaningless. In such aggregations, products which were secondary to the individual component industries often became primary to the composite industry. For instance, the individual Census industries comprising the interindustry Apparel sector show aggregate shipments of secondary products valued at $798,619,000. However, an analysis of the individual items indicated that only $4,586,000 of these were products primary to Census industries which were not components of the composite Apparel sector. The remainder was primary to component Census apparel industries and hence also primary to the composite Apparel sector. Consequently, $794,033,000 of shipments were automatically shifted from the secondary products category where initially classified to become primary products of the composite category.

Inputs to Primary Industry

Cost of materials, fuels, etc.

As indicated earlier, the 1947 Census of Manufactures published for most industries the cost of materials, fuel, electricity, and contract work actually consumed during the year. This figure served as one of the important control values in the input reports. However, it had to be modified to take into consideration some of the output modifications indicated previously. Where the outputs of industries had been augmented to include government manufacturing operations, or manufacturing operations in trade, or Census undercoverage, or revaluation of toll work, the cost of materials had to be increased accordingly to include inputs associated with the additions to outputs. Usually, the adjustments to the cost of materials values as well as to the individual input values were proportional to the increases in outputs, i.e., the input structure for the increased output was assumed to be the same as for output of the basic industry. In the case of toll work revaluation, the cost of materials was augmented by the same amount as the primary products shipments, thus leaving unchanged the nonmaterial charges residual for the industry.

One additional modification was introduced in the cost of materials value to compensate for special treatment accorded force-account construction 2/ maintenance. In the Census treatment of an industry, all costs associated with force-account construction maintenance were included in the cost structure of the industry. Hence, material costs associated with such force-account construction maintenance were included in the Census value for cost of materials. However, in the Interindustry Relations Study all construction activity, both contract and force-account, was included in the scope of the construction industry, with the individual industries purchasing maintenance construction services. Consequently, individual inputs associated with force-account construction maintenance were eliminated from the input structures of the industries in order to avoid duplications.

2/ "Force-account construction," as performed by private concerns, is that accomplished by employees of a private business organization not in the construction industry for the use of the organization in its normal business operations.

Such adjustments were estimated for each industry and applied to the cost of materials controls. In general, individual input entries were not affected because they were originally estimated only for the commodities produced. However, because of inability to identify the items in all cases, specific materials inputs may still include varying amounts chargeable to force-account construction maintenance. 3/

Entries representing both domestic and foreign transfers-in were made on the input side to balance the entries on the output side. These input entries, however, do not refer to materials entering into the production of the products transferred in, but rather to the values of the products themselves, because the former have already been accounted for in the originating industries.

Nonmaterial charges

In the Interindustry Relations Study the nonmaterial charges included purchased services as well as factor payments and other charges, and was derived as the residual after subtracting the cost of materials, supplies, fuel, electricity, and contract work from total inputs to primary industry, the latter being identical in value with total production of primary industry. In the 1947 Census of Manufactures, the item most similar to nonmaterial charges is "value added," which was there defined as the difference between total shipments of an industry and the cost of materials, fuel, electricity, and contract work, and was intended as a measure of the contribution of the manufacturing process to the value of finished manufactured products.

The nonmaterial charges item differs from the Census "value added," and tends to exceed the latter for several reasons. First, there was the difference between production and shipments of an industry. Where there was a net increase in finished goods inventory of the producing industry (which had been the case for most manufacturing industries in 1947) shipments were lower than production; consequently, Census "value added," which was based on shipments, was less than the nonmaterial charges item, which was based on production. Second, as indicated earlier, modifications were introduced in the cost of materials figures for

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3/ The costs associated with force-account construction maintenance which had to be excluded from Census costs of materials were those charged to current account by the reporting establishments.

many industries to correspond with changes in the production figures. These generally tended to increase the nonmaterial charges item. Third, in the Interindustry Relations Study the cost of materials control was reduced to exclude material costs associated with force-account construction maintenance, as indicated earlier. As total inputs were not affected, this again tended to increase the nonmaterial charges residual.

The purchased services item for an industry represents a summation of the individual service allocations by the relevant service industries to the industry under consideration. The method of allocating services to the different industries varies with each industry and is explained in greater detail in the output reports of the service industries. Included in this item are Federal Government and State and local government excise taxes on the few services where relevant. Similar excise taxes on material purchases are included in cost of materials.

The factor payments and other charges item is derived by subtracting purchased services from the nonmaterials charges control total. This item includes: taxes paid to government, except excises and duties; factor costs, such as wages and salaries, employer contributions to private pension plans, royalties, interest, entrepreneurial income, and corporate profits after taxes; conventional nonfactor charges, such as transfer payments, depreciation and amortization, capital outlays charged to current expense, and losses and accidental damage to capital; and special types of nonfactor charges, such as charges for business travel and entertainment, banking service cash charges to business, and claim payments. In the 1947 Interindustry Relations Study the above factor costs and both types of nonfactor costs appeared as payments to the "households" sector.

Allocation Procedures and Sources

Distribution of inputs

For intermediate industries, corresponding input and output controls are identical, i.e., gross input is identical with gross output and total input to primary industry is identical with total output (production) of primary industry. Thus, once the output controls were developed, the corresponding input controls were automatically established.

The main input problem was the development of distribution patterns, i.e., the determination of the industrial sources of the purchases. Such distributions were not developable by any standard method. For each industry the method had some unique features geared to the available information and to the inherent problems. Nevertheless, several basic sources supplied some information for all the manufacturing industries and additional information for many of them.

1. Consumption of fuels and purchased electric energy: This information was published in the 1947 Census of Manufactures for every covered industry. The electric energy purchased was given separately and the fuel consumption total was further broken down into components, such as bituminous coal, anthracite, coke, fuel oils, gas, and other fuel, so that the industrial source for each type of fuel could be identified with relative ease.

2. Consumption of selected metal mill shapes and forms and rough and semifinished castings: This information was published in the 1947 Census of Manufactures for most metal-consuming industries in the primary metals industries group, the fabricated metal products group, the machinery groups, the transportation equipment group, and a few other industries. In general, the remaining industries were presumed to consume no more than relatively small amounts of metal in unfabricated or semifabricated form.

In the case of a few industries for which metal consumption represented a significant input though not a large part of total output of the respective metals, it was possible to estimate such from other sources.

3. Consumption of other specified materials: For a number of industries data were provided by the 1947 Census of Manufactures on consumption of specified materials, such as animals slaughtered by the meat packing industry, selected agricultural products consumed by the prepared feeds industry, flour used by the bakery industries, and lumber products consumed in some of the lumber manufacturing industries.

4. MB-234 materials purchases survey: This was a survey of 1949 materials purchases by a sample of some 1,500 establishments in the metal fabricating industries, conducted by the U. S. Bureau of the Census for the Munitions Board, with summary data made available to the Bureau of Labor Statistics. Control totals from individual reports were

reconciled with corresponding controls in reports collected for the 1949 Annual Survey of Manufactures of the Census Bureau and then adjusted on an industry basis to conform with industry control totals from the 1947 Census of Manufactures. This survey provided most of the basic input (purchases) data for the industries sampled.

5. Glass survey: The U. S. Bureau of the Census conducted a survey for the Bureau of Labor Statistics of materials purchased by major glass manufacturing plants. Data were obtained from 77 plants operated by 11 companies. The information obtained made it possible to fill in most of the major gaps on the input side for the glass industry.

6. Trade associations and individual companies: During the course of the project a great many trade associations and individual companies were approached for information and review of estimates. However, the acquisition and use of material from these sources created problems, inasmuch as such data generally were not geared to the 1947 Interindustry Relations Study and normally required considerable adjustment before they could be made applicable to an industry.

7. Engineering and chemical process data: These data were obtained from engineering and chemical processes handbooks. The formulas and "flow charts" incorporated in these handbooks were extremely useful in making initial estimates of the materials requirements, particularly in the chemicals industries. These estimates were modified when appraised in the light of other data but were of major importance in developing the preliminary estimates of use of certain key materials.

8. Other books and periodicals: Generally, these sources did not supply any specific input patterns for manufacturing industries. However, they were useful in supplying background information and direction for further research.

9. IIR-002: An unpublished Census Bureau tabulation of listed imports for consumption into continental United States in 1947, grouped by I-O category and compiled for the Bureau of Labor Statistics. The noncompetitive imports are components of the cost of materials control totals. The competitive imports, however, are only input entries designed to balance to augmented output entries, as indicated earlier.

10. Output reports of other industries: For some industries direct input patterns were not available. However, output reports of other industries indicated distributions of products to some of these industries. These output distributions were retabulated by consuming industry and incorporated in the relevant input reports.

Distribution of outputs

The gross output was distributed by two main types of allocations. The least important was the indirect allocation or transfer-out of secondary products and other transferred products to the relevant primary or "dummy" industry for distribution to consuming industries. The major distribution was the allocation of primary products directly to consuming industries.

Transfers of secondary products were indicated in part in the 1947 Census of Manufactures (Standard Table V). Judgment estimates were made for transferring other secondary products. A considerable amount of secondary products remained unallocated in many of the industry reports.

The distribution of primary products to consuming industries was a major task for the industry analyst and gave rise to many problems. As in the case of the distribution of inputs, no standard procedure was applicable to all manufacturing industries. However, for most industries the first attempt in distributing the primary products took the form of a commodity flow analysis. The product detail shown in the Census was studied to determine which of the products could be categorized as being essentially household items or producers' durable goods or intermediate goods for industry use. Where products could be put in any two or all three categories, attempts were made to determine roughly the percentage belonging to each category. Difficult problems arose in the determination of such percentages. For instance, large Diesel engines normally were capitalized by most industries but treated as current account expenditures in the tractor industry when they were incorporated into tractors. Another example was provided by television sets, which were sold mostly to households, but some were sold to bars and grills and other amusement places where they might have been considered producers' durable equipment. In these and other cases there was little information upon which to base distribution of commodities to the various categories. By necessity, such determinations had to be quite rough and based almost entirely on judgment rather than on quantitative data or precise estimating techniques. Most estimates derived in this fashion were tentative, because some of these products, regardless of category, were exported or purchased by Federal or State and local governments. Moreover, separate analyses of other sectors occasionally led to some modifications.

Having grouped the commodities into those tentatively belonging to the households, producers' durable goods, and intermediate categories, the next task was to make the necessary modifications for other final demand uses and distribute the residual intermediate category to the individual consuming industries. The following were some of the procedures and sources used in this connection:

1. Trade and other publications: Publications such as Facts for Industry, Minerals Year Book, Yearbook of the American Bureau of Metal Statistics, Lumber Industry Facts, Petroleum Facts and Figures, Cotton Counts its Customers, and Industrial Marketing contained extensive information which could be utilized either directly or in some modified form for purposes of distribution of output. In some instances, output distribution information available from these publications for aggregates of commodities and industries could be broken down into finer detail by various procedures utilizing related information gathered from other sources.

2. Individual companies and trade associations: As indicated earlier, many trade associations and a number of individual companies were contacted for whatever information and assistance they could provide that might be useful in developing input and output distributions for various industries. In general, not much of this type of information could be utilized directly in the studies. However, in some instances such information was useful for developing estimating techniques and checking previous estimates.

3. Related information: In some industries where no direct distribution information was available, an attempt was made to obtain data on the use of other products or equipment which could reasonably be assumed to have a high correlation with the use of the particular products under analysis. This information then could be used to devise a system of weights for distributing the products to consuming industries. For example, parts for various industrial machinery were distributed to industries which use such machinery, on the basis of either inventory information on the

ownership of such machinery or relative production by industries using such machinery in their production processes.

4. Input reports of consuming industries: For many products, direct distribution patterns were not available. However, input reports of other industries often indicated consumption of such items, based on the MB-234 survey and other data. Expenditure distributions determined for the construction and government sectors were particularly useful in this regard. Such input data were retabulated by producing industry and incorporated in the relevant output reports.

5. EIR-002: This is an unpublished Census Bureau tabulation of listed exports of U. S. merchandise from continental United States, grouped by I-O category and compiled for the Bureau of Labor Statistics.

Allocation of marketing charges

Several kinds of marketing (or distribution) charges can be distinguished: transportation charges, which include railroad transportation, other water transportation, trucking, air transportation, petroleum pipelines, and warehousing, storage, and stockyards; trade margins, which include wholesale and retail trade margins; and taxes, which include Federal transportation excise taxes, other Federal excise taxes, and State and local excise taxes. Each of these distribution charges was developed as an aggregate to be associated with the sum of the primary products of each producing industry, including transfers-in.

In general, transportation charges, including Federal excise taxes on transportation, were allocated in direct proportion with the value of each individual transaction, unless there was information available to justify differential allocation. Wholesale trade margins were also frequently allocated in proportion to the transactions. Special consideration was given to transactions involving exports, government, and intermediate industries. Retail trade margins were allocated mostly to households, although in some instances they were also allocated to producers' durable goods and intermediate products transactions. Federal excise taxes, other than on transportation, and State and local excise taxes were generally allocated along with those sales where such taxes were considered to be relevant, e.g., sales to consumers. No taxes were allocated with transactions involving government and exports.

Reconciliation of input-output estimates

In many instances input estimates and output distributions were made independently. Therefore, it was necessary at some stage to set up a system whereby such estimates could be reconciled. This was done by retabulating the input estimates by producing industry and comparing such tabulations with the respective output distributions. In instances of difference, the estimates were reconciled where possible. Where no clear-cut decision could be reached in favor of one or the other of the estimates, the estimate most consistent with the other estimates in the particular report was usually presented. In such cases the discussion may have included the reasons for both estimates.

Distribution of miscellaneous receipts

The output of most manufacturing industries included receipts from activities that were not readily classifiable within the categories of primary or secondary production. Such receipts arose from contract and commission work, repair work, sale of scrap and salable refuse, and miscellaneous nonmanufacturing activities, and were shown in the 1947 Census of Manufactures for each industry in the indicated detail, under the general heading of "Miscellaneous Receipts." In distributing the output of each industry it was also necessary to distribute the miscellaneous receipts component, i.e., to determine the industrial sources of such receipts.

In general, there was very little information available to aid in the distribution of the receipts from contract and commission work, repair work, and miscellaneous nonmanufacturing activities. For a few industries where the background information permitted reasonable assumptions with regard to some item of the miscellaneous receipts, such assumptions were made and the items distributed accordingly. Thus, in the case of the apparel industry, it was reasonable to assume that most of the contract and commission work was for other plants of the same industry, except for some estimated amount of contract work for government. Hence, the receipts from contract and commission work in that industry were distributed to government and to the apparel industry itself. For most industries, however, the available information was inadequate for making such assumptions and the receipts from the enumerated activities were left unallocated.

In the case of scrap the situation was different. Sufficient information on scrap consumption had been developed in the input studies of the various industries to enable the distribution of practically all the known scrap production. Here the difficulty lay in the fact that most of the scrap consumption information was not in sufficient detail to indicate the exact nature and industrial source of such scrap. Most of the scrap consumption information could be categorized only as either metal or nonmetal. The problem was solved, therefore, by setting up two "dummy" industries--I-O 5093.1, Waste Products, Metal, and I-O 5093.2, Waste Products, Nonmetal--to which most of the scrap would be transferred from the producing industries and which would serve as the central sources from which scrap would be distributed to the consuming industries. It was usually possible to classify the producing industry's scrap as metal or nonmetal by considering the type of products produced. Scrap produced outside of manufacturing was added to the scrap stockpile by means of inventory depletions (i.e., from previous years).

Here, too, there were a few instances where both the scrap production and consumption information appeared in sufficient detail to enable the distribution of such scrap directly from the producing industry to the consuming industries. Where such information was available, the direct method of distribution was employed. For most industries, however, the indicated indirect method was necessary.

BLS Report No. 11

WORK STOPPAGES

Collection and Compilation of Work Stoppage Statistics

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BUREAU OF LABOR STATISTICS

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Collection and Compilation of Work Stoppage Statistics [1]

Estimates showing the number of stoppages, workers involved, and man-days idle in the United States are issued monthly by the United States Department of Labor's Bureau of Labor Statistics. Annually, totals are compiled and the statistics are also presented by such classifications as industry, State, city, [2] major issue, and duration. Strike statistics are a broad indicator of industrial unrest. They provide a quantitative measure of the extent to which labor-management disputes result in stoppages of work.

The Bureau of the Census in 1880 made the first attempt to secure statistics on strikes and lockouts. In that year schedules were sent to employers and workers in all disputes about which notices appeared in the public press. Information was received on 762 situations. Some data were obtained on causes of strikes, their results, as well as their State distribution. No information was secured on number of workers or man-days of idleness.

Subsequently, the method of collecting the information varied, and the statistical series on work stoppages thus automatically fall into several historical groupings. For the year 1880, data on strikes and lockouts were gathered at the time the Tenth Census was taken. For the period 1881-1905, the United States Bureau of Labor collected data on stoppages, excluding those that involved fewer than 6 workers or lasted less than 1 day--a practice that the Bureau follows currently. In this period, data were published on the number of strikes and the workers involved, with breakdowns by industry and State, number of establishments involved, and the percentage of strikes involving labor organizations.

No Federal agency collected national information on stoppages from 1906 to 1913. The Bureau of Labor compiled data on only the number of stoppages during 1914-15. Information on the number of workers involved was subsequently added for approximately two-thirds of the known stoppages in the 1916-26 period. Data available for all of these years are included in BLS Bulletin No. 651, "Strikes in the United States, 1880-1936."

Since 1927, a fairly uniform procedure has been followed in obtaining detailed information from the parties involved in work stoppages. Figures have been prepared on the amount of idleness during work stoppages each month as well as on the number of stoppages and number of workers involved.

Scope

Coverage of the present series extends to all known strikes and lockouts within the continental United States that involve six or more workers and last a full day or shift. Stoppages of American seamen or other workers in foreign ports are not included, nor are strikes of foreign crews on foreign ships in American ports. All employees made idle in the establishment are counted as "involved," even though they may not be active participants or supporters of the controversy. All days on which work was scheduled are included in calculating man-days of idleness. In industries, such as basic steel and rubber, where there are continuous operations, appropriate adjustments are made for the fact that substantial proportions of workers are employed on Saturday and Sunday. The worker figure is a "peak"--that is the number idle on the day of maximum idleness. However, computations of idleness take account of variations in the number of workers idle from period to period during the strike.

The Bureau defines a strike as a temporary stoppage of work by a group of employees to express a grievance or enforce a demand. Usually the issue in dispute is directly between the employer(s) and the striking employees, but there are significant exceptions. For example, in jurisdictional, as well as in rival union or representation strikes, the motivating factors may largely involve two or more unions rather than the employer directly. In a sympathy strike, no dispute usually exists between the striking workers and their immediate employer. The purpose of such strikes is to give union support or broaden group pressure for the benefit of another group of workers. Some protest strikes are intended to register the dissatisfaction of workers with action (or lack of action) by local, State, or Federal Government agencies on matters affecting their interests.

A lockout is defined as a temporary withholding of work by an employer (or a group of employers) to enforce terms of employment upon a group of employees. No attempt is made to distinguish statistically between strikes and lockouts because of the difficulty of determining the facts. Stoppages are included in the series regardless of who may be deemed "responsible," or which party takes the initiative, and the terms "strike" and "work stoppage" are used interchangeably.

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[1] Revision of the article included in BLS Bulletin No. 993, "Techniques of Preparing Major BLS Statistical Series." The revision was prepared by Lily Mary David and Ann J. Herlihy of the Bureau's Division of Wages and Industrial Relations.

[2] Before 1952, "city" in this series referred to actual city boundary lines. Beginning in 1952 this definition was broadened to include the entire metropolitan area. See section on geographical classification.

So-called slowdowns, where employees continue at work but at reduced production speed, are not included, nor are those instances in which workers report an hour or two late each day as a protest gesture or quit work several hours before closing time to attend rallies or mass meetings.

Survey Methods and Sources

The Bureau seeks to obtain complete coverage of all stoppages of six or more workers, lasting at least a full shift. It does not base the strike series upon a sample, but includes all stoppages of the specified size and duration for which verified information is obtained.

Information on the existence of a stoppage is currently obtained from various sources, including (1) clippings on labor disputes from daily and weekly newspapers throughout the country; (2) notices received directly from the Federal Mediation and Conciliation Service; (3) a periodic compilation by the local offices of State employment security agencies provided through the Bureau of Employment Security of the U.S. Department of Labor; (4) information received from other State agencies (such as State mediation boards and State Labor Departments); (5) various employers and employer associations; (6) international unions and their publications; and (7) construction firms doing work for the Atomic Energy Commission.

All of these sources were not developed at once. Thus in 1943, a new cooperative arrangement was set up with the Solid Fuels Administration which resulted in additional strike leads. When this agency went out of existence at the end of World War II, cooperative arrangements were made with local associations of coal companies. Requests are sent also to several hundred individual companies, not members of associations. Before 1943, undoubtedly many of the small, short local strikes in coal mining were missed.

Cooperation of State agencies was developed gradually, mostly in the period after World War II. By 1950 about half the States were providing information and in mid-1950 arrangements for obtaining information from the others were completed. These changes, it is estimated, have significantly increased the number of strikes reported, but since most of the added stoppages are small, the numbers of the workers involved and of the man-days of idleness have been very little affected.

Questionnaires are mailed to all parties to any work stoppages reported by one of the previously mentioned sources. This procedure is designed to secure first-hand knowledge of the number of workers involved, the dates and duration of the stoppage, major issues involved, method of settlement, and related information. In some instances, field agents of the Bureau secure the necessary data; in others, representatives of cooperating States may contact the parties.

Strikes, by their very nature, are usually a matter of public knowledge and reporting by newspapers and other publications. However, the Bureau holds confidential the individual reports submitted by employers and unions, as well as supplementary data collected through State or Federal agencies.

Calculation Procedures

The Bureau's preliminary monthly strike series is based in large part on estimates, although these totals seldom vary significantly from the later, final reports prepared from the parties' replies. This is mainly due to the availability of fairly accurate data on the larger stoppages when preliminary estimates are made. The final strike statistics compiled annually are the result of compilation of actual data received on the schedule form from the parties involved in the stoppages. These final statistics are published each year in the May issue of the Monthly Labor Review. More detailed data are included in an annual bulletin.

Estimates are prepared and published monthly on the three measures of work stoppages: (1) number of stoppages; (2) number of workers involved; and (3) man-days of idleness. Such estimates are compiled about 4 weeks after the end of the month of reference from the most accurate information available on all stoppages known to the Bureau. As there is a lag between the occurrence and reporting of a number of relatively small strikes, allowance is made (depending upon several variables) for these smaller stoppages in preparing the estimates of disputes occurring within the month. Estimates of the number of workers involved and of total idleness are based upon information on individual stoppages of 500 or more workers and/or 5,000 or more man-days of idleness; and on the Bureau's information and experience about smaller stoppages.

The total man-days of idleness during the month because of strikes is published as a percentage of estimated working time of all workers. "Estimated working time" is computed for purposes of this table by multiplying the average number of employed workers by the number of days worked by most employees. This number excludes Saturdays when customarily not worked, Sundays, and established holidays.

"Total employed workers" used in making these computations before 1951 refers to all workers except those in occupations and professions in which there is little if any union organization or in which strikes rarely occur. Beginning in 1951, the concept of "total employed workers" was changed to coincide with the Bureau's figures of nonagricultural employment, excluding Government but not excluding workers in other occupational groups. Tests show that the percentage of total idleness computed on the basis of the new and the old figures usually differs by less than one-tenth of a point whereas the percentage of workers idle differs by about 0.5 or 0.6 of a point. The following tabulation compares the figures for 1950 computed on the old and new bases:

Base	Percent of -	
	Workers	Man-days of idleness
Old	6.9	.44
New	6.3	.40

The annual series includes total number of stoppages, workers involved, and man-days of idleness. Compilation of such statistics is essentially a process of assembling the necessary information on individual cases, followed by analysis, evaluation, and classification into groups. Application of technical statistical formulae is not involved.

The statistical unit is the individual strike or lockout, irrespective of size. If groups of employees (regardless of their number or geographic distribution) join in a work stoppage for a common objective, their action is classed as a single strike.

The figure for the number of workers involved in a strike or lockout is the maximum number actually made idle in the establishment directly involved. As already indicated, no distinction is made between the actual participants in a strike and those respecting, or kept idle, by picket lines or those sent home by the employer when a stoppage in one department closes the plant.

Man-days of idleness, like the number of workers involved, are based on the idleness at the establishments directly involved. Workers involved multiplied by days of idleness equal total man-days idle. When the number of workers idle varies significantly during the period of the stoppage, adjustment is made accordingly in the calculation of man-days of idleness. In this calculation, holidays and days not normally worked are omitted from the count of days of idleness.

The annual statistics are classified according to a number of significant factors, briefly described here:

1.--An industrial classification is made of each strike in accordance with the Standard Industrial Classification Manual published by the United States Bureau of the Budget. A few stoppages directly affect workers in more than one industry. Small stoppages falling in this category are classified in the industry having the majority of workers involved; in large interindustry stoppages, there is proportionate allocation.

2.--The duration of each stoppage is computed on the basis of calendar, rather than working days, i.e., the number of calendar days from the beginning until the end of the stoppage. For stoppages which begin at a definite time and are terminated by a formal agreement at a definite time, no problem arises in determining duration. Some strikes, however, are never formally settled, although the workers may gradually go back to their jobs or find other employment; employers may be able to resume production with new recruits or may close their plants permanently. In such cases, the stoppages are terminated, for statistical purposes, when a majority of the vacancies are filled and production begins to approach normal. On occasion, an actual settlement is reached later; the statistical record of the stoppage is then reopened and the figures are adjusted correspondingly.

3.--Number of establishments involved. The establishment is actually a single workplace, for example, a factory, mine, or store. In a widespread strike of intercity bus drivers, truck drivers, or railroad workers, the establishment is regarded as the terminal out of which the employees work; in a strike of seamen, the ship is the establishment; and in a strike of dock workers, the individual dock or loading place is regarded as the place of work.

4.--Geographical classification of stoppages followed State and city boundary lines through 1951. Data were compiled each year for 150 separate cities (excluding suburban areas outside the corporate limits). Beginning in 1952, the compilation of data by metropolitan, or industrial, areas superseded city boundary lines. Information is now compiled for approximately 180 such areas. In interstate stoppages, the workers involved and man-days idle are allocated to their respective States.

5.--The causes of most strikes are multiple and varied, and do not always lend themselves readily to immediate and exact classification. After evaluation of the information available, the stoppages are classified by issues into four broad categories: (1) wages and/or hours and/or fringe benefits; (2) union organization matters (representation, union security, and the like); (3) other working conditions, such as job security, physical working conditions, administrative policies, and workload; or (4) inter- or intraunion matters. Within these groups there are further subdivisions into more specific categories.

6.--Union involved is another major classification. For this purpose the union involved is the union which has taken active leadership in the stoppage. In disputes involving more than one union (jurisdictional or rival union disputes as well as those of cooperating unions), classification is made accordingly. If unorganized workers strike independently, a separate classification is used. For publication purposes, the union information is combined, and presented by major affiliation of the unions, i.e., American Federation of Labor, Congress of Industrial Organizations, Independent, single firm or no union.

7.--Method of termination of stoppages involves classification into the following categories: (1) disputes in which the parties agree directly to terminate the stoppage without any third-party assistance; (2) those terminated with the assistance of government agencies; (3) those terminated with the assistance of private or nongovernment mediators; (4) those ending without formal settlements; and (5) those in which the employers discontinued business.

8.--Disposition of issues presents information regarding the settlement of the issues in the stoppage. In most strikes the issues are usually settled or disposed of before the return to work is effected, but provision is made for the cases in which adjustment of issues after resumption of work is effected by: (1) direct negotiations between the employers and the union (or workers); (2) negotiations with the aid of government agencies; (3) arbitration; and (4) other means (cases referred to NLRB, union boards, tribunals, and other agencies where method is other than by negotiation).

The questionnaire on page 5 is used in collecting detailed information from both employers and unions. An abridged version of this schedule is sent to (1) parties in which the lead information indicates that fewer than 250 workers are involved, and (2) the participants in very large industrywide or Nationwide stoppages, in which information on many of the details requested in the longer questionnaire is available from other sources.

Limitations of the Series

It is not known to what extent the methods used to locate and obtain information on work stoppages result in a complete count of the number of work stoppages. However, they provide a virtually complete record of all large work stoppages so that the statistics on numbers of workers and of man-days lost are believed to be essentially complete. As indicated earlier, the addition of new sources of strike information from time to time has probably not seriously affected the continuity of the series on workers and man-days idle. The new sources of information, however, have resulted in some lack of strict comparability in the number of strikes reported from period to period.

Some of the finer more detailed classifications may be relatively less complete than the over-all statistics. Thus, while the figures by individual states are undoubtedly fairly complete, in isolated cases the figures for a specific tabulation by state and industry group may be appreciably affected by lack of information about one strike.

Within the limits that the Bureau places on the series, work stoppages involving few workers or lasting short periods (i.e., fewer than 6 workers or lasting less than a full shift) are omitted from the count. Such disputes usually would be of little importance in the over-all count, and frequently cause no significant idleness or interruption to production.

This series cannot be used as a basis for the measurement of the cost of strikes, in terms of the amount of production and wages lost. The calculation of such items involves many factors for which information is not available, including, for example, production schedules before and after the stoppage, flow of raw materials, and amount of overtime worked by employees.

Secondary idleness is not measured; in other words, the figures do not cover those employees made idle in other establishments or industries as a result of material or service shortages resulting from a work stoppage. At times, the idleness of employees directly involved in a strike may be considerably less than the idleness of other workers brought about indirectly. No satisfactory measurement, however, has been evolved to measure or estimate such indirect effects adequately. The Bureau's work stoppage series is limited to the establishments in which the actual strike idleness occurs, except in the case of workers who refuse to cross picket lines set up by a striking union at other establishments.

FILE ____________

U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON 25, D. C.

B. L. S. 817—(Rev. 1-1-52).
Budget Bureau No. 44-R210.10.
Approval expires 3-31-54.

CONFIDENTIAL—Not for public inspection

DEAR SIR: The Bureau of Labor Statistics has received information

The Bureau is responsible for the collection of statistics on work stoppages in the United States. To insure the accuracy of these figures, we try to obtain reports from all parties involved in such stoppages. We shall appreciate your furnishing the information requested below as soon as possible. The envelope enclosed for your reply requires no postage. If you do not have the information, please forward this form to the proper official or give us his name and address. Thank you very much for your cooperation.

Very truly yours,

EWAN CLAGUE,
Commissioner of Labor Statistics.

---

1. Name of employer ____________

2. Address of central office ____________

3. Principal products or services of establishment(s) involved in work stoppage (list in order of importance) ____________

4. Number of establishments (or work places) involved ____________

5. Union(s) involved ____________ (Name) (Check) AFL ______ CIO ______ Ind. ______

Local No. ____________ Address ____________

6. Dates and number of workers idle. (Please report information for each establishment directly involved in the dispute. In these establishments report the total number idle—both workers directly concerned and those made idle because of dispute.)

Establishment Involved and Location (City, County, and State)	First Day of Stoppage			Period Greatest Number of Workers Were Idle		Last Day of Stoppage		Number of Workers on Payroll (before stoppage)
	Date	Hour	Workers Idle	Dates	Workers Idle	Date	Workers Idle	

(Use additional sheets if more space is needed)

7. How many workers were idle at least one full shift or working day? ____________

8. Number of days worked *per week* by most employees before stoppage ____________

9. Causes of dispute.
    (*a*) *Principal* issue or issues: ____________
    (*b*) Other *subsidiary* issues: ____________

(PLEASE ANSWER ALL QUESTIONS ON REVERSE SIDE ALSO)

16—53858-3

10. Relation of stoppage to union-management contract:

Was contract in effect when stoppage occurred: Yes ________ No ________

Dispute was due primarily to: (Check)

(*a*) Attempt to obtain union recognition ________; or establish first contract . . . . ________

(*b*) Grievances . . . . ________

(*c*) Renegotiation or alteration of contract . . . . ________

(*d*) Other matters (specify) . . . . ________

____

11. Did a Federal, State, or local government agency participate in negotiations *before the stoppage began?*

Yes ________ No ________ If "yes" give name of agency ________________

12. Method of terminating stoppage:

Agreement or understanding for return to work was reached: (Check)

(*a*) By employer(s) and union directly . . . . ________

(*b*) With assistance of government agency:

Federal (Name ________________) . . . . . ________

State (Name ________________) . . . . . ________

Local (Name ________________) . . . . . ________

(*c*) By other means (explain) ________________

________________ . . . . . ________

Workers returned without formal arrangement or settlement . . . . ________

13. (*a*) Date settlement was reached ________________

(*b*) Date most employees resumed work ________________

14. Were all issues completely settled or disposed of at *termination* of stoppage? Yes ________ No ________

If not, please indicate how the remaining issues were to be finally adjusted: (Check)

(*a*) By direct negotiations between employer(s) and union . . . . ________

(*b*) By negotiations with the aid of a government agency. Name ________________

(*c*) By arbitration (Name of arbitrator) ________________

(*d*) By other means (indicate) ________________

____

15. *If no agreement to terminate stoppage has been reached,* have the majority of the vacancies been filled (either by old or new employees)? Yes ________ No ________ If "yes," give date by which majority of vacancies were filled

____
(Date)

16. REMARKS:

____

____

____

____

____

____

____

____

____
(Signature of person making report)

____
(Position or office)

____
(Company or organization)

____
(Address)

____
(Date)

BLS Report No. 12

WAGE STRUCTURE

Electric and Gas Utilities

JULY 1952

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UNITED STATES DEPARTMENT OF LABOR

BUREAU OF LABOR STATISTICS

BLS Report No. 12

WAGE STRUCTURE

Electric and Gas Utilities

July 1952

UNITED STATES DEPARTMENT OF LABOR
Martin P. Durkin - Secretary
BUREAU OF LABOR STATISTICS
Ewan Clague - Commissioner
Washington 25, D. C.
March 1953

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WAGE STRUCTURE: ELECTRIC AND GAS UTILITIES, JULY 1952 [1]

Plant workers in privately operated electric and gas utility systems averaged $1.75 an hour in July 1952, exclusive of overtime and shift premiums. Hourly earnings ranged from 75 cents to more than $2.70 but slightly more than half the labor force earned from $1.50 to $2. Journeymen linemen had average earnings of $2.07 an hour; meter readers, $1.55; and gas main installation and service laborers, $1.27. In the office occupations studied, women cashiers averaged $1.27 and general stenographers $1.36 an hour.

Characteristics of the Industry

The 2,285 generating plants of privately owned electric utilities in the United States produced more than 300 billion kilowatt-hours in 1951. [2] An additional 69 billion kilowatt-hours were produced by publicly owned utilities, and 63 billion by industrial establishments. The 1951 production of privately owned utilities represents an increase of approximately 67 percent over the total for 1945 and 141 percent over 1940. In 1951, steam plants generated almost five-sixths of the electricity produced by privately owned systems; hydro plants, about a sixth; and internal combustion plants, less than 1 percent.

In 1951, utility systems supplied 48.2 billion therms of gas to nearly 25 million customers. [3] Approximately 93 percent was natural gas; 4 percent, manufactured; and 3 percent, mixed gas. Sales to the 23 million residential customers amounted to approximately 16.2 billion therms, and to industrial customers about 25.5 billion therms. The total sales (in therms) in 1951 represented an increase of about 86 percent over 1945 and 180 percent over 1940. Sales of natural gas showed the greatest increases during these intervals, 98 percent and 205 percent, respectively. The 1951 total for manufactured gas, on the other hand, was about 12 percent less than in 1945.

The 227 privately operated utility systems included in the July 1952 wage study were nearly evenly distributed among the three types --electric systems, gas systems, and combined systems providing both electricity and gas. The employment in the gas systems, however, was smaller than in either of the other two types. Although natural gas was supplied by most systems, the distribution of manufactured gas or mixed gas was reported by some establishments in a majority of the economic regions. The operations in nearly all electric systems studied included generation, transmission, and distribution. Approximately three-fifths of the systems used steam power in generating electricity, and a fourth used a combination of steam and hydro power.

---

[1] Prepared by Fred W. Mohr of the Bureau's Division of Wages and Industrial Relations. The information was collected by field representatives under the direction of the Bureau's regional wage and industrial relations analysts.

The survey covered privately operated utility systems employing more than 100 workers and primarily engaged in any of the following: generation, transmission, and/or distribution of electricity; transmission and/or distribution of natural gas, production and distribution of manufactured gas, or distribution of mixed gas; combined electric and gas utilities. In systems also providing allied services such as water, steam heat and power, or urban transportation, plant workers in these departments were excluded from the study.

[2] Federal Power Commission data.

[3] Gas Facts, American Gas Association, New York, 1952.

The plant (nonoffice) labor force consisted almost exclusively of men, very few of whom were paid on an incentive basis. About a fourth of all workers in the industry were employed in office occupations. Among the office jobs studied, women constituted a majority of the workers in nearly all instances; substantial numbers of men, however, were employed as accounting clerks and as general clerks.

National Wage Data

Plant workers in electric and gas utility systems had average straight-time hourly earnings of $1.75 in July 1952 (table 3). Workers in electric systems averaged $1.78; in gas systems, $1.60; and in combined systems, suppliers of both electricity and gas, $1.78 (table 4). Slightly more than half earned from $1.50 to $2 an hour; approximately 9 percent received $2.25 or more and about the same proportion, less than $1.25.

A majority of the plant workers were employed in the 45 selected jobs for which data are presented. Load dispatchers and watch engineers had the highest national average earnings, $2.44 and $2.35 an hour, respectively (table 10). Other plant jobs in which workers averaged over $2 an hour included journeymen linemen ($2.07), class A metermen ($2.01), steam-plant operators (single-unit plants) ($2.27), class A switchboard operators ($2.06), trouble men ($2.11), maintenance electricians ($2.08), and maintenance machinists ($2.07). Gas main installation and service laborers ($1.27) and janitors ($1.31) had the lowest average earnings. Earnings for only 4 other plant jobs averaged less than $1.50 an hour (groundmen, gas plant laborers, gas meter repairmen helpers, and guards). A large number of workers were employed as meter readers with average earnings of $1.55 an hour.

A comparison of earnings of workers in electric systems and combined systems discloses that for most jobs there was comparatively little difference in averages. For example, the respective earnings in electric and combined systems were $1.41 and $1.42 for groundmen; $2.08 and $2.14 for trouble men; journeymen linemen had average earnings of $2.07 an hour in both types of systems (table 11). In gas systems, on the other hand, earnings of workers in the selected jobs were lower than in the combined systems. Gas-main fitters, for example, averaged $1.69 in gas systems and $1.77 in combined systems; gas-main fitters' helpers, $1.45 and $1.59; main installation and service laborers, $1.22 and $1.35; and gas appliance servicemen, $1.80 and $1.85, respectively.

In jobs found in all three types of systems, workers in systems supplying both electricity and gas generally had higher average earnings than workers in the other two types of systems. Average earnings in electric systems were usually higher than in gas systems. Among numerically important jobs, maintenance electricians averaged $2.10 in combined systems, $2.08 in electric systems, and $1.96 in gas systems; janitors, $1.38, $1.26, and $1.24; and meter readers, $1.61, $1.49, and $1.54, respectively.

Earnings levels in systems employing more than 1,000 workers were generally higher than in those with fewer employees (table 12). For a majority of the jobs for which comparisons could be made, the national averages in the larger systems were from 11 to 19 cents higher than in smaller ones.

Among numerically important office occupations studied women accounting clerks, cashiers, and general stenographers had average earnings of $1.28, $1.27, and $1.36, respectively (table 13). Men hand bookkeepers averaged $2.02 and accounting clerks $1.72.

Regional Variations

In the Middle Atlantic and Great Lakes regions where almost half the plant workers were employed, straight-time hourly earnings in July 1952 averaged $1.80 and $1.84, respectively. Average earnings were highest in the Pacific region, $1.99. In the other regions, earnings levels were from 2 to 23 cents an hour below the $1.75 national average.

The distribution of workers' earnings varied considerably by region. The proportion of workers receiving less than $1.50 an hour, for example, ranged from about 3 percent in the Pacific region to more than 40 percent in the Southeast and Southwest. At the other extreme, approximately 12 percent of the workers in the Southwest and Middle West received $2 or more an hour, compared with 46 percent in the Pacific region.

Regional average earnings for the selected plant jobs followed about the same pattern as the over-all regional averages. The average hourly earnings in the Pacific region were highest for nearly all occupations. In the Middle Atlantic and Great Lakes regions, earnings levels were higher than the national averages for more than three-fourths of the jobs for which data are presented. In each of the other 6 regions, a majority of the occupational averages were below the national levels.

For the 23 occupations for which data are presented in all regions, the differences between the lowest and the highest regional averages ranged from 12 percent to more than 60 percent. For a majority of the jobs, however, the differences amounted to less than 30 percent.

Hourly rates of $2.20 or more were received by nearly all journeymen linemen in the Pacific region, by approximately a third in the Middle Atlantic and Great Lakes regions, and by a tenth or less in each of the other regions (table 6). Approximately two-thirds of the gas main installation and service laborers in the Pacific region, three-tenths in Great Lakes, and a sixth in New England earned $1.50 or more (table 7). In the other regions, less than a tenth of the workers were employed at such rates.

Related Wage Practices

A 40-hour week for first-shift workers in July 1952 constituted the work schedule of establishments employing more than 95 percent of the plant workers and nearly 90 percent of the office employees (table 20). An eighth of the plant workers in the Middle West and a tenth in the Southwest were employed by systems having 44-hour workweeks. Schedules of less than 40 hours a week were reported by firms with a tenth of the total office employment.

Late shifts were operated in all regions as the generation of electricity and the manufacture of gas are generally on a continuous basis. About 7 percent of the workers were employed on second-shift and 6 percent on third-shift operations (table 21). Shift differential payments were common, the most prevalent amounts being 4 or 5 cents for second-shift and 6 cents for third-shift work.

Paid vacations were provided by all establishments studied. Almost three-fifths of the plant workers and seven-tenths of the office workers were employed in systems granting 2 weeks after a year of service (table 22). After 2 years' service, the proportions receiving 2-week vacations increased to 90 and 93 percent, respectively. A policy of 3-week vacations after 15 years' service was in effect in establishments with almost three-fourths of the plant and office workers

Virtually all workers were granted paid holidays. Although the number of days ranged from 4 to 12, almost two-thirds received 6, 7, or 8 days annually (table 23). In the New England and Middle Atlantic regions, a majority of the workers received 10 or more paid holidays a year.

Insurance or pension plans, financed at least in part by the employer, were almost universal in privately owned electric and gas utilities. Practically all workers were covered by life insurance plans and a majority by hospitalization and health plans (table 25). Retirement pension plans also were in effect in systems employing nearly 95 percent of the workers.

Formal provisions for paid sick leave also were prevalent in this industry. Systems employing approximately two-thirds of the workers reported sick leave benefits of full pay without a waiting period (table 26). The number of days of leave varied considerably. In each region, however, the most common provision after a year of service was either 5 or 10 days. An additional 14 percent of the plant and 7 percent of the office workers were employed in systems having limited-type plans which either required a waiting period or provided only partial pay.

TABLE 1: Number of systems and workers in electric and gas utilities in the United States and number studied by the Bureau of Labor Statistics, July 1952

Region 1/	Total industry 2/							
	Total		Electric systems		Gas systems		Combined systems	
	Systems	Workers	Systems	Workers	Systems	Workers	Systems	Workers
United States	332	478,130	123	172,441	3/ 109	95,070	3/ 100	210,619
New England	55	30,289	25	14,716	15	4,599	15	10,974
Middle Atlantic	56	121,033	16	29,827	27	19,767	13	71,439
Border States	29	37,264	13	13,363	12	8,717	4	15,184
Southeast	41	34,093	20	22,344	18	6,554	3	5,195
Great Lakes	49	117,043	14	49,531	11	19,408	24	48,104
Middle West	26	30,340	3	2,082	3	5,017	20	23,241
Southwest	45	55,747	15	21,162	20	23,965	10	10,620
Mountain	15	11,940	9	4,609	(3/)	(3/)	3/ 6	7,331
Pacific	16	40,381	8	14,807	3	7,043	5	18,531
	Number studied							
United States	227	414,091	83	141,455	3/ 70	82,162	3/ 74	190,474
New England	33	25,159	14	12,406	8	2,853	11	9,900
Middle Atlantic	34	101,452	10	21,470	16	15,870	8	64,112
Border States	16	31,592	6	8,493	6	7,915	4	15,184
Southeast	27	30,852	12	20,202	12	5,455	3	5,195
Great Lakes	36	99,457	11	37,758	10	19,203	15	42,496
Middle West	24	28,359	3	2,082	3	5,017	18	21,260
Southwest	29	45,525	12	19,931	12	18,806	5	6,788
Mountain	12	11,314	7	4,306	(3/)	(3/)	3/ 5	7,008
Pacific	16	40,381	8	14,807	3	7,043	5	18,531

1/ The regions used in this study include:

New England	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont;
Middle Atlantic	New Jersey, New York, and Pennsylvania;
Border States	Delaware, District of Columbia, Kentucky, Maryland, Virginia, and West Virginia;
Southeast	Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee;
Great Lakes	Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin;
Middle West	Iowa, Kansas, Missouri, Nebraska, North Dakota, and South Dakota;
Southwest	Arkansas, Louisiana, Oklahoma, and Texas;
Mountain	Arizona, Colorado, Idaho, Montana, New Mexico, Utah, and Wyoming;
Pacific	California, Nevada, Oregon, and Washington.

2/ Includes establishments with more than 100 workers. Employment includes office and supervisory personnel as well as plant workers. Estimated plant worker employment at time of survey (table 3) was 282,153.

3/ Data for gas systems in the Mountain region included with combined systems to avoid disclosure of information for individual operations.

TABLE 2: Number of electric and gas utility systems studied, by selected characteristic, United States and region, July 1952

Item	Number of systems studied in -									
	United States	New England	Middle Atlantic	Border States	South-east	Great Lakes	Middle West	South-west	Mountain	Pacific
Total systems studied	227	33	34	16	27	36	24	29	12	16
Unionization										
Union	190	29	30	12	21	35	22	15	10	16
Nonunion	37	4	4	4	6	1	2	14	2	-
Size of system										
101 - 1,000 workers	110	24	15	6	17	12	14	8	7	7
1,001 or more workers	117	9	19	10	10	24	10	21	5	9
Type of system										
Electric service only	83	14	10	6	12	11	3	12	7	8
Gas service only	71	8	16	6	12	10	3	12	1	3
Electric and gas service	73	11	8	4	3	15	18	5	4	5

TABLE 3: Percent distribution of plant workers in electric and gas utilities, by average straight-time hourly earnings 1/ and region, July 1952

Average hourly earnings 1/ (in cents)	United States	New England	Middle Atlantic	Border States	South-east	Great Lakes	Middle West	South-west	Moun-tain	Pacific
75 and under 80	0.3	(2/)	(2/)	0.1	1.3	(2/)	1.0	1.5	0.1	(2/)
80 and under 85	.2	-	(2/)	.1	1.3	(2/)	.3	1.0	.1	-
85 and under 90	.3	-	0.1	.1	2.2	(2/)	.3	1.0	.6	-
90 and under 95	.4	0.1	.1	.8	1.5	0.1	.3	1.7	(2/)	-
95 and under 100	.5	.1	.1	.6	2.3	(2/)	.5	1.6	.1	-
100 and under 105	1.2	.2	.6	1.0	2.4	.5	1.7	4.6	.6	(2/)
105 and under 110	1.2	.3	.5	1.4	3.9	.2	2.0	4.0	.3	-
110 and under 115	1.2	.6	.5	2.1	3.1	.3	1.6	3.8	.1	-
115 and under 120	1.7	.7	1.3	2.1	4.4	.4	2.5	4.6	.5	-
120 and under 125	2.0	1.5	1.9	3.7	3.1	.4	3.7	4.5	2.6	(2/)
125 and under 130	2.3	2.3	2.1	4.1	3.4	1.2	3.4	3.8	3.5	(2/)
130 and under 135	2.3	2.9	2.2	4.9	2.8	1.4	3.2	2.8	3.7	0.1
135 and under 140	3.2	2.4	3.6	4.9	4.0	2.3	4.0	4.6	4.0	.1
140 and under 145	3.0	5.2	1.8	4.5	3.0	2.8	4.2	4.1	4.2	1.7
145 and under 150	4.2	4.6	4.3	4.4	4.0	3.7	8.5	3.8	5.9	.9
150 and under 155	4.6	8.1	4.7	6.0	2.6	4.7	5.8	4.3	4.6	1.6
155 and under 160	4.8	6.8	4.4	7.1	3.3	4.6	7.0	5.7	4.2	1.8
160 and under 165	5.7	7.8	5.8	4.8	4.9	6.5	7.0	4.9	7.0	1.9
165 and under 170	5.6	7.4	4.3	6.7	6.3	5.6	6.2	4.5	4.8	7.6
170 and under 175	5.6	8.0	5.7	5.5	2.9	6.5	5.8	4.0	3.8	6.1
175 and under 180	5.3	5.8	5.3	5.0	2.1	7.3	4.3	3.9	4.0	5.5
180 and under 185	5.1	6.1	5.6	3.1	3.8	5.1	5.1	4.3	9.5	6.1
185 and under 190	5.2	4.6	6.0	2.5	4.2	6.3	4.3	4.4	2.7	5.5
190 and under 195	5.0	4.9	6.5	4.6	2.5	5.3	1.7	2.2	5.1	8.3
195 and under 200	4.8	2.8	5.8	3.0	1.7	6.6	3.4	2.6	6.9	6.5
200 and under 205	3.2	4.1	2.9	3.7	1.0	4.2	1.8	1.5	3.7	5.0
205 and under 210	3.6	4.2	3.2	2.3	2.1	4.5	1.3	4.0	3.5	6.6
210 and under 215	2.5	2.2	2.4	2.2	2.2	2.5	2.4	1.5	2.5	4.7
215 and under 220	3.6	1.5	4.3	1.4	10.7	3.0	2.3	1.2	4.6	4.4
220 and under 225	2.7	1.5	1.9	.3	2.9	3.0	2.4	1.1	2.2	11.1
225 and under 230	2.4	1.0	4.9	1.9	.7	2.1	.7	.3	1.4	2.6
230 and under 235	1.9	.7	3.5	2.9	.7	1.8	.6	.4	.5	2.1
235 and under 240	1.0	.4	1.2	.2	.9	1.1	.3	1.0	.6	2.0
240 and under 245	.7	.1	.6	.2	.3	1.4	.1	.2	.5	1.4
245 and under 250	1.2	.1	.8	.2	.7	2.2	.1	.2	.4	3.7
250 and under 260	.8	.4	.6	.4	.4	1.4	.1	.2	.4	1.7
260 and under 270	.3	.2	.1	.4	.1	.6	(2/)	.1	.5	.3
270 and over	.4	.4	.4	.8	.3	.4	.1	.1	.3	.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	282,153	17,430	73,998	23,047	20,893	66,473	17,935	32,358	7,688	22,331
Average hourly earnings 1/	$1.75	$1.71	$1.80	$1.65	$1.60	$1.84	$1.61	$1.52	$1.73	$1.99

1/ Excludes premium pay for overtime and night work.

2/ **Less than 0.05 percent.**

TABLE 4: Percent distribution of plant workers in electric and gas utilities, by average straight-time hourly earnings, 1/ region, and type of system, July 1952

Average hourly earnings 1/ (in cents)	United States 2/			New England			Middle Atlantic			Border States		
	Electric systems	Gas systems	Combined systems	Electric systems	Gas systems	Combined systems	Electric systems	Gas systems	Combined systems	Electric systems	Gas systems	Combined systems
75 and under 80	0.4	0.6	0.2	-	-	(3/)	(3/)	-	(3/)	0.1	-	0.1
80 and under 85	.2	.6	.1	-	-	-	0.1	0.1	-	.2	-	(3/)
85 and under 90	.5	.6	.1	-	-	-	.2	-	0.1	.1	-	.1
90 and under 95	.6	.9	.1	0.3	0.1	-	.1	.1	(3/)	2.3	0.2	(3/)
95 and under 100	.5	.9	.3	.3	-	-	.1	.1	.1	.1	.5	.9
100 and under 105	1.2	1.8	.9	.3	-	0.2	.2	.2	.8	2.1	1.0	.2
105 and under 110	1.3	1.9	.8	.4	(3/)	.2	.5	.4	.6	2.5	.5	1.1
110 and under 115	1.5	1.8	.7	.8	.4	.4	.4	.6	.5	4.6	.7	.8
115 and under 120	2.1	2.3	1.1	1.0	.7	.3	3.0	1.3	.6	1.5	3.6	1.8
120 and under 125	1.5	3.3	1.9	1.5	1.2	1.5	1.9	4.3	1.3	1.0	1.6	6.9
125 and under 130	2.2	2.7	2.2	3.0	2.2	1.4	.7	3.7	2.2	3.4	1.7	5.9
130 and under 135	2.4	2.7	2.1	3.3	4.3	1.8	2.6	3.2	1.8	5.8	5.3	4.0
135 and under 140	3.0	2.9	3.6	2.5	2.5	2.2	3.0	4.5	3.6	7.4	1.0	5.0
140 and under 145	2.4	4.3	3.0	4.2	11.0	4.0	1.4	4.3	1.3	3.8	7.0	3.8
145 and under 150	3.9	5.7	3.7	3.8	8.0	4.4	5.7	5.3	3.4	6.0	3.2	3.8
150 and under 155	4.1	6.0	4.5	8.9	10.9	5.5	3.9	7.1	4.4	5.0	10.6	4.3
155 and under 160	3.4	8.1	4.5	5.4	12.4	6.3	4.4	8.8	3.2	4.1	14.2	5.8
160 and under 165	5.4	6.1	5.7	6.4	13.2	7.3	5.4	7.8	5.7	4.9	4.8	4.7
165 and under 170	4.3	8.4	5.2	6.8	12.4	6.2	5.8	8.9	2.3	3.2	13.9	5.6
170 and under 175	5.4	6.2	5.5	6.8	8.9	9.2	5.8	8.5	4.8	5.6	8.1	4.0
175 and under 180	4.1	6.8	5.4	4.9	6.4	6.8	3.6	7.2	5.5	2.8	9.5	4.2
180 and under 185	5.6	5.0	4.8	5.7	2.6	8.1	7.0	6.7	4.6	3.7	.4	3.9
185 and under 190	4.8	6.0	5.0	5.1	.8	5.6	6.2	6.2	6.0	1.9	1.4	3.6
190 and under 195	4.4	3.2	6.2	6.1	.5	5.1	2.9	4.4	8.8	5.9	3.5	4.1
195 and under 200	5.4	3.1	5.1	2.3	.6	4.5	9.4	3.6	4.7	5.4	.2	2.7
200 and under 205	3.7	1.9	3.3	5.7	.3	3.7	4.0	1.6	2.7	1.1	1.0	7.4
205 and under 210	3.8	1.6	4.4	4.7	.3	5.3	3.2	.6	3.8	3.0	.9	2.6
210 and under 215	2.4	1.5	3.0	2.3	.2	2.9	2.0	.4	3.1	.9	5.1	1.7
215 and under 220	4.3	.7	4.3	1.7	-	1.9	2.8	.1	6.1	.8	-	2.6
220 and under 225	3.3	1.1	3.1	1.8	.1	1.6	.8	(3/)	2.9	.2	-	.5
225 and under 230	2.9	.4	2.8	.8	-	1.7	6.3	(3/)	5.6	2.8	-	2.1
230 and under 235	1.8	.2	2.8	.8	(3/)	.8	.4	-	5.8	6.8	.1	1.4
235 and under 240	1.4	.3	1.0	.7	-	.3	1.5	-	1.4	-	-	.4
240 and under 245	1.2	.1	.5	.1	-	(3/)	.3	(3/)	.8	-	-	.5
245 and under 250	2.2	.1	.8	.2	-	.1	1.6	-	.7	(3/)	-	.4
250 and under 260	1.3	.1	.7	.7	-	(3/)	1.4	(3/)	.5	.3	-	.8
260 and under 270	.4	(3/)	.3	.2	-	.2	.4	-	.1	.1	-	.9
270 and over	.7	.1	.3	.5	-	.5	1.0	-	.2	.6	-	1.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	100,608	56,630	124,915	8,395	2,685	6,350	19,111	11,865	43,022	7,767	5,342	9,938
Average hourly earnings 1/	$1.78	$1.60	$1.78	$1.73	$1.57	$1.76	$1.80	$1.62	$1.85	$1.64	$1.60	$1.69

See footnotes at end of table.

TABLE 4: Percent distribution of plant workers in electric and gas utilities, by average straight-time hourly earnings, 1/ region, and type of system, July 1952 - Continued

Average hourly earnings 1/ (in cents)	Southeast		Great Lakes			Middle West			Southwest		
	Electric systems	Gas systems	Electric systems	Gas systems	Combined systems	Electric systems	Gas systems	Combined systems	Electric systems	Gas systems	Combined systems
75 and under 80	1.5	1.7	-	-	(3/)	-	0.1	1.3	1.3	1.7	1.2
80 and under 85	.4	5.6	-	0.1	(3/)	0.4	-	.4	.9	.6	1.8
85 and under 90	1.5	5.6	(3/)	(3/)	0.1	.2	.1	.4	1.6	.8	.3
90 and under 95	1.1	3.8	0.1	(3/)	.1	.8	-	.3	1.9	2.2	.2
95 and under 100	1.2	5.9	(3/)	.1	.1	.6	-	.6	2.2	1.5	.8
100 and under 105	2.3	4.8	.2	.3	.9	1.2	.5	1.9	4.5	5.1	3.7
105 and under 110	2.3	10.5	.1	.1	.4	5.8	.1	2.1	4.9	4.0	2.1
110 and under 115	2.8	6.8	.1	.6	.4	4.8	-	1.8	4.2	4.0	2.6
115 and under 120	4.1	3.2	.4	.6	.4	4.3	.1	2.9	4.5	5.3	3.2
120 and under 125	2.5	3.5	.1	.9	.4	4.1	2.2	4.0	3.3	6.5	1.8
125 and under 130	3.3	4.3	.8	2.7	1.0	4.1	1.7	3.7	5.3	2.7	3.2
130 and under 135	3.1	3.5	.5	1.8	2.2	3.9	1.2	3.6	3.4	2.5	2.2
135 and under 140	4.7	3.3	1.3	1.0	3.8	3.9	.8	4.8	4.0	4.9	5.0
140 and under 145	2.8	2.3	1.6	4.0	3.4	3.4	.8	5.1	3.3	4.7	4.2
145 and under 150	3.6	5.5	2.8	3.6	4.7	3.4	29.8	4.2	4.6	3.2	3.7
150 and under 155	2.8	2.7	3.9	5.8	5.1	6.6	.1	7.1	3.2	5.2	4.1
155 and under 160	4.0	2.5	2.7	5.9	5.9	5.2	6.6	7.2	2.5	9.3	3.9
160 and under 165	4.9	2.9	6.3	5.9	7.0	2.9	5.3	7.6	6.1	4.8	2.9
165 and under 170	5.7	4.3	3.4	11.4	5.7	5.3	6.2	6.2	3.3	5.4	4.9
170 and under 175	3.6	1.2	5.4	8.1	6.8	6.5	4.8	6.0	4.1	4.2	3.4
175 and under 180	1.6	3.7	6.9	10.7	6.1	2.5	4.7	4.3	3.2	4.1	4.7
180 and under 185	3.6	3.5	5.0	4.9	5.3	4.3	13.4	3.3	6.6	2.4	4.6
185 and under 190	3.9	5.7	6.3	8.3	5.6	2.0	10.8	2.9	3.0	4.9	5.9
190 and under 195	2.4	1.6	5.7	3.4	5.8	.7	1.5	1.8	3.2	1.7	1.5
195 and under 200	2.1	.5	5.8	6.5	7.2	13.4	5.5	2.1	3.4	.9	5.1
200 and under 205	1.2	.4	5.3	2.4	3.8	3.1	3.1	1.3	1.7	1.7	.5
205 and under 210	2.4	.3	5.1	1.4	5.0	.7	.6	1.5	2.7	1.8	12.0
210 and under 215	2.8	.2	3.1	2.4	1.9	2.6	(3/)	3.0	.9	.8	4.3
215 and under 220	13.8	.1	5.1	.2	2.0	.7	-	3.0	.9	1.7	.3
220 and under 225	3.4	(3/)	4.1	4.2	1.5	2.3	-	3.0	.4	.2	4.7
225 and under 230	1.0	(3/)	3.4	.7	1.3	.3	-	.8	.3	.3	.4
230 and under 235	.9	(3/)	2.8	.6	1.3	-	-	.7	.7	.3	.1
235 and under 240	.6	-	1.3	.9	1.1	-	-	.4	2.3	.3	.2
240 and under 245	.2	(3/)	2.9	.1	.4	-	-	.1	.4	.1	.1
245 and under 250	.7	(3/)	3.6	(3/)	1.7	-	-	.1	.4	.1	(3/)
250 and under 260	.6	(3/)	2.5	.1	.7	-	-	.2	.4	.1	.1
260 and under 270	.1	(3/)	.6	(3/)	.8	-	-	.1	.2	(3/)	.2
270 and over	.5	.1	.8	.3	.1	-	-	.2	.2	-	.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	13,301	4,052	28,065	10,979	27,429	1,128	3,164	13,643	12,142	14,336	5,880
Average hourly earnings 1/	$1.66	$1.30	$1.93	$1.74	$1.78	$1.57	$1.66	$1.60	$1.52	$1.47	$1.65

1/ Excludes premium pay for overtime and night work.
2/ Includes data for regions not shown separately.
3/ Less than 0.05 percent.

TABLE 5: Percent distribution of groundmen in electric utilities, by average straight-time hourly earnings 1/ and region, July 1952

Average hourly earnings 1/ (in cents)	United States	New England	Middle Atlantic	Border States	South-east	Great Lakes	Middle West	South-west	Moun-tain	Pacific
80 and under 85	(2/)	-	-	-	-	-	-	0.1	-	-
85 and under 90	(2/)	-	-	-	-	-	-	.2	-	-
90 and under 95	0.2	-	-	1.6	0.2	-	-	.4	-	-
95 and under 100	1.1	-	-	.3	.2	-	4.4	4.7	-	-
100 and under 105	1.6	-	1.7	1.0	-	-	.5	7.4	-	-
105 and under 110	3.4	3.5	-	5.2	4.3	-	12.5	8.2	-	-
110 and under 115	3.2	.7	.4	3.4	4.7	-	6.0	10.3	-	-
115 and under 120	6.6	.3	3.8	3.7	21.2	0.2	7.3	12.2	0.5	-
120 and under 125	6.9	4.2	8.8	11.4	15.7	.3	15.9	4.3	11.7	-
125 and under 130	8.6	10.2	3.4	21.7	16.6	3.2	10.5	10.3	6.5	-
130 and under 135	6.6	5.2	7.5	27.6	7.2	1.4	4.0	5.7	5.5	-
135 and under 140	13.9	20.0	31.2	15.2	17.6	13.1	5.6	7.6	23.0	-
140 and under 145	4.8	5.2	.7	4.9	8.2	8.6	3.3	5.1	5.5	-
145 and under 150	7.9	1.7	15.4	3.0	4.1	23.2	2.4	1.8	2.6	-
150 and under 155	10.0	31.6	18.3	.1	-	25.8	5.8	3.7	18.3	1.0
155 and under 160	3.2	4.5	.2	.2	-	12.1	8.0	-	5.5	1.4
160 and under 165	5.8	9.5	5.7	-	-	5.9	13.8	14.3	6.0	1.4
165 and under 170	2.8	1.7	.5	-	-	1.4	-	.6	6.8	14.6
170 and under 175	6.0	.7	1.1	.7	-	3.0	-	.8	2.6	35.5
175 and under 180	3.0	1.0	.2	-	-	1.7	-	1.1	5.5	16.2
180 and under 185	3.4	-	.1	-	-	-	-	1.2	-	22.9
185 and under 190	1.0	-	.2	-	-	-	-	-	-	7.0
190 and under 195	(2/)	-	.2	-	-	1	-	-	-	-
195 and under 200	(2/)	-	.3	-	-	-	-	-	-	-
200 and under 205	(2/)	-	.2	-	-	-	-	-	-	-
205 and under 210	-	-	-	-	-	-	-	-	-	-
210 and under 215	(2/)	-	.1	-	-	-	-	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	9,804	286	1,326	963	1,455	1,772	551	1,692	385	1,374
Average hourly earnings 1/	$1.42	$1.44	$1.41	$1.29	$1.27	$1.50	$1.32	$1.28	$1.46	$1.76

1/ Excludes premium pay for overtime and night work.
2/ Less than 0.05 percent.

TABLE 6: Percent distribution of journeymen linemen in electric utilities, by average straight-time hourly earnings 1/ and region, July 1952

Average hourly earnings 1/ (in cents)	United States	New England	Middle Atlantic	Border States	South-east	Great Lakes	Middle West	South-west	Moun-tain	Pacific
115 and under 120	(2/)	-	-	0.2	-	-	-	-	-	-
120 and under 125	(2/)	-	-	-	0.3	-	-	-	-	-
125 and under 130	(2/)	-	-	.5	.2	-	-	-	-	-
130 and under 135	0.2	-	-	.3	1.0	-	0.6	-	-	-
135 and under 140	.2	-	-	1.2	1.0	-	.2	-	-	-
140 and under 145	.1	-	-	-	-	-	.7	0.5	-	-
145 and under 150	.4	1.3	-	2.0	.6	-	.4	1.0	-	-
150 and under 155	.6	-	-	2.1	.9	-	4.2	1.1	-	-
155 and under 160	.8	-	-	3.6	1.9	0.4	2.8	1.4	-	-
160 and under 165	2.8	3.0	1.3	2.7	2.8	.6	22.3	2.1	-	-
165 and under 170	1.6	2.2	-	.7	1.0	.6	13.2	2.4	-	-
170 and under 175	2.8	11.7	-	5.5	1.9	.1	8.1	8.9	0.7	-
175 and under 180	2.5	9.4	-	4.0	1.4	.8	2.4	10.9	3.7	-
180 and under 185	3.1	.4	1.6	3.6	3.9	1.9	6.2	11.0	4.9	-
185 and under 190	3.6	.3	3.9	5.3	2.9	5.4	1.2	8.3	.5	0.1
190 and under 195	5.6	4.0	4.3	23.9	6.6	5.3	2.6	8.7	4.7	-
195 and under 200	12.0	5.5	14.6	11.2	6.6	19.8	10.1	5.9	37.6	-
200 and under 205	5.8	11.4	9.3	17.0	-	7.2	.1	1.3	9.1	.1
205 and under 210	9.9	36.4	3.8	2.6	9.6	12.8	3.1	20.5	9.5	-
210 and under 215	3.1	8.5	3.3	1.5	5.5	1.5	1.2	5.7	4.4	(2/)
215 and under 220	13.7	.2	23.3	4.8	49.6	6.7	15.0	-	15.4	.1
220 and under 225	13.9	4.6	3.4	-	2.3	14.3	5.6	-	9.5	68.5
225 and under 230	7.4	.6	29.3	7.3	-	2.5	-	-	-	.9
230 and under 235	1.4	.2	1.9	-	-	4.1	-	-	-	-
235 and under 240	2.2	-	-	-	-	2.0	-	10.3	-	5.9
240 and under 245	2.2	.3	-	-	-	7.7	-	-	-	3.2
245 and under 250	4.1	-	-	-	-	6.3	-	-	-	21.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	15,975	1,120	3,400	860	1,725	3,612	1,130	1,509	591	2,028
Average hourly earnings 1/	$2.07	$1.97	$2.12	$1.91	$2.02	$2.12	$1.83	$1.94	$2.03	$2.29

1/ Excludes premium pay for overtime and night work.
2/ Less than 0.05 percent.

TABLE 7: Percent distribution of main installation and service laborers in gas utilities, by average straight-time hourly earnings 1/ and region, July 1952

Average hourly earnings 1/ (in cents)	United States	New England	Middle Atlantic	Border States	South-east	Great Lakes	Middle West	South-west	Moun-tain	Pacific
75 and under 80	2.6	-	-	-	3.2	-	-	9.1	-	-
80 and under 85	1.6	-	-	-	8.4	-	1.1	2.6	-	-
85 and under 90	1.6	-	-	-	15.7	-	-	-	-	-
90 and under 95	2.7	-	-	-	4.0	-	1.7	8.3	-	-
95 and under 100	3.1	-	-	1.5	18.5	-	-	4.8	-	-
100 and under 105	7.3	-	0.3	6.0	2.1	2.8	5.8	21.4	-	-
105 and under 110	5.9	0.9	-	4.5	28.8	.6	8.3	6.0	-	-
110 and under 115	5.1	-	1.2	.6	8.1	2.6	.6	14.0	-	-
115 and under 120	5.5	-	1.2	11.9	2.0	1.8	3.4	14.3	-	-
120 and under 125	8.5	-	15.4	21.3	1.2	.7	6.7	12.5	18.9	-
125 and under 130	8.7	10.2	29.3	13.7	2.3	9.6	5.1	1.2	2.4	-
130 and under 135	5.8	15.7	10.8	5.1	4.4	11.2	2.0	.5	13.0	-
135 and under 140	7.7	4.2	17.0	-	-	18.8	4.1	1.2	11.9	-
140 and under 145	11.1	31.1	6.3	35.4	1.3	18.7	2.8	3.3	22.4	28.9
145 and under 150	11.7	20.8	12.1	-	-	4.0	55.2	.7	25.7	6.0
150 and under 155	2.9	2.8	5.5	-	-	8.7	.6	.1	-	2.3
155 and under 160	1.2	7.4	-	-	-	3.3	1.0	-	-	5.2
160 and under 165	.8	4.6	.9	-	-	1.7	.6	-	5.7	-
165 and under 170	5.4	1.4	-	-	-	12.4	-	-	-	57.6
170 and under 175	.6	-	-	-	-	2.6	.1	-	-	-
175 and under 180	.1	-	-	-	-	-	.9	-	-	-
180 and under 185	-	-	-	-	-	-	-	-	-	-
185 and under 190	.1	.9	-	-	-	.5	-	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	10,700	216	1,608	648	1,068	2,201	1,404	2,666	370	519
Average hourly earnings 1/	$1.27	$1.43	$1.33	$1.27	$1.01	$1.42	$1.35	$1.07	$1.38	$1.57

1/ Excludes premium pay for overtime and night work.

TABLE 8: Percent distribution of appliance servicemen in gas utilities, by average straight-time hourly earnings 1/ and region, July 1952

Average hourly earnings 1/ (in cents)	United States 2/	New England	Middle Atlantic	Southeast	Great Lakes	Middle West	Southwest
90 and under 95	(3/)	-	-	-	-	-	0.4
95 and under 100	(3/)	-	-	-	-	-	.4
100 and under 105	0.2	-	-	0.4	-	-	1.8
105 and under 110	.3	-	-	-	-	-	3.6
110 and under 115	.2	-	-	.4	-	0.3	1.0
115 and under 120	.1	-	-	.2	-	.7	.7
120 and under 125	.3	-	-	1.8	-	-	2.7
125 and under 130	.6	-	0.6	2.7	-	-	2.7
130 and under 135	1.3	-	3.2	1.6	(3/)	1.1	2.1
135 and under 140	.7	2.3	-	4.9	0.1	.3	2.2
140 and under 145	1.1	-	.5	4.7	.4	1.5	6.8
145 and under 150	.9	3.9	.6	.9	.1	-	3.4
150 and under 155	1.6	4.0	.6	7.4	.3	4.3	3.6
155 and under 160	5.8	10.9	6.3	6.3	1.1	11.6	18.0
160 and under 165	5.7	19.5	3.3	6.9	5.5	2.7	8.3
165 and under 170	5.9	12.2	9.3	4.7	3.4	7.0	6.7
170 and under 175	8.2	10.8	8.4	3.6	11.4	4.4	6.5
175 and under 180	11.0	24.0	10.2	17.4	13.8	9.4	3.3
180 and under 185	11.4	9.9	14.0	11.9	6.6	14.1	5.3
185 and under 190	9.1	.1	9.7	22.5	12.8	12.4	3.6
190 and under 195	7.3	.7	10.0	-	10.1	-	1.2
195 and under 200	7.9	.6	5.1	1.3	14.2	19.2	1.2
200 and under 205	7.1	-	11.6	-	3.3	9.8	5.0
205 and under 210	5.9	1.1	4.9	-	3.1	-	-
210 and under 215	2.4	-	.3	.4	.4	-	.6
215 and under 220	1.0	-	1.4	-	.6	-	6.2
220 and under 225	3.2	-	-	-	10.5	-	-
225 and under 230	.7	-	-	-	2.3	-	.6
230 and under 235	(3/)	-	-	-	-	-	.6
235 and under 240	-	-	-	-	-	-	-
240 and under 245	-	-	-	-	-	-	-
245 and under 250	(3/)	-	-	-	-	.3	-
250 and under 260	.1	-	-	-	-	.3	1.5
260 and under 270	(3/)	-	-	-	-	.3	-
270 and under 280	(3/)	-	-	-	-	.3	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	8,734	696	2,170	447	2,621	742	674
Average hourly earnings 1/	$1.82	$1.68	$1.81	$1.68	$1.89	$1.80	$1.64

1/ Excludes premium pay for overtime and night work.
2/ Includes data for regions not shown separately.
3/ Less than 0.05 percent.

TABLE 9: Percent distribution of meter readers in electric and gas utilities, by average straight-time hourly earnings, 1/ region, and type of system, July 1952

Average hourly earnings 1/ (in cents)	United States 2/				New England				Middle Atlantic				Border States			
	All systems	Electric systems	Gas systems	Combined systems	All systems	Electric systems	Gas systems	Combined systems	All systems	Electric systems	Gas systems	Combined systems	All systems	Electric systems	Gas systems	Combined systems
75 and under 80	(4/)	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
80 and under 85	(4/)	.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
85 and under 90	0.1	.2	.1	(4/)	-	-	-	-	-	-	-	-	-	-	-	-
90 and under 95	.5	1.2	.3	-	0.2	0.5	-	-	0.1	-	0.3	-	0.5	1.3	-	-
95 and under 100	1.0	2.2	.8	0.1	.4	.9	-	-	-	-	-	-	.1	.3	-	-
100 and under 105	1.3	2.1	1.8	.3	.5	.9	-	0.3	-	-	-	-	-	-	-	-
105 and under 110	1.2	1.7	1.4	.6	.6	.9	-	.7	.2	-	.6	-	1.2	2.0	1.9	-
110 and under 115	2.2	3.3	3.0	.8	3.2	4.6	2.0	2.1	.2	-	.6	-	1.8	3.6	1.9	-
115 and under 120	2.7	3.6	4.6	.7	2.8	3.2	2.0	2.8	1.7	3.1	.8	1.3	.9	.3	3.7	-
120 and under 125	2.6	2.0	2.5	3.3	4.5	5.3	3.1	4.5	2.4	-	1.4	4.4	3.2	1.3	-	6.8
125 and under 130	4.0	4.3	4.5	3.3	10.2	17.8	6.1	1.4	1.3	.7	3.2	.6	3.0	2.6	3.1	3.3
130 and under 135	5.8	7.2	5.4	4.7	11.4	11.9	14.3	8.3	7.5	13.5	5.9	4.8	4.5	4.9	6.2	3.3
135 and under 140	5.2	5.7	3.5	5.7	1.7	.7	.5	4.1	7.0	12.1	5.2	5.0	6.4	13.0	.6	2.9
140 and under 145	4.8	6.7	4.3	3.6	5.1	2.5	14.3	2.8	3.5	2.5	4.8	3.2	4.5	4.9	8.0	2.3
145 and under 150	7.3	10.6	2.7	7.5	2.8	3.4	.5	3.4	8.9	19.3	3.8	5.6	23.2	34.9	2.5	22.5
150 and under 155	7.0	6.1	6.2	8.2	19.4	23.0	3.6	24.2	3.3	1.7	6.6	2.2	6.1	1.0	4.3	12.1
155 and under 160	7.9	7.5	7.8	8.3	17.5	20.3	26.6	6.9	6.5	10.9	11.1	.9	12.6	3.6	6.8	24.7
160 and under 165	10.9	7.2	14.9	11.3	4.1	3.2	7.7	3.1	13.9	9.1	20.3	13.4	3.0	2.9	8.0	.3
165 and under 170	6.7	6.9	7.3	6.2	6.5	.7	17.3	7.9	7.6	9.5	10.0	5.0	3.5	1.3	12.3	1.0
170 and under 175	6.5	6.6	9.3	4.8	6.8	-	1.0	21.0	9.4	10.9	19.3	2.5	8.6	3.9	33.3	.3
175 and under 180	6.4	3.2	5.6	9.7	1.2	-	1.0	3.1	11.8	6.7	.8	21.6	9.8	.3	7.4	20.5
180 and under 185	5.1	5.4	5.0	4.9	.6	-	-	2.1	.2	-	-	.3	6.6	16.6	-	-
185 and under 190	3.1	1.5	7.0	1.9	-	-	-	-	1.7	-	5.3	.6	.1	.3	-	-
190 and under 195	6.2	1.2	.6	13.8	-	-	-	-	12.8	-	-	28.6	.1	.3	-	-
195 and under 200	.8	1.6	.7	.2	.1	.2	-	-	-	-	-	-	.3	.7	-	-
200 and under 205	.2	.3	.4	.1	.3	-	-	1.0	-	-	-	-	-	-	-	-
205 and under 210	.2	.5	.1	(4/)	.1	-	-	.3	-	-	-	-	-	-	-	-
210 and under 215	(4/)	.1	.1	-	-	-	-	-	-	-	-	-	-	-	-	-
215 and under 220	.3	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220 and under 225	(4/)	(4/)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
225 and under 230	(4/)	(4/)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
230 and under 235	(4/)	-	(4/)	-	-	-	-	-	-	-	-	-	-	-	-	-
235 and under 240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
240 and under 245	(4/)	-	(4/)	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	10,169	3,465	2,565	4,139	924	438	196	290	2,598	717	711	1,170	776	307	162	307
Average hourly earnings 1/	$1.55	$1.49	$1.54	$1.61	$1.47	$1.41	$1.50	$1.54	$1.61	$1.52	$1.57	$1.68	$1.53	$1.50	$1.58	$1.53

See footnotes at end of table.

TABLE 9: Percent distribution of meter readers in electric and gas utilities, by average straight-time hourly earnings, 1/ region, and type of system, July 1952 - Continued

Average hourly earnings 1/ (in cents)	Southeast			Great Lakes				Middle West	Southwest				Mountain	Pacific
	All systems 3/	Electric systems	Gas systems	All systems	Electric systems	Gas systems	Combined systems	All systems	All systems	Electric systems	Gas systems	Combined systems	All systems	All systems
75 and under 80	0.1	0.2	-	-	-	-	-	-	0.1	0.2	-	-	-	-
80 and under 85	.2	-	1.2	-	-	-	-	-	.3	.7	-	-	-	-
85 and under 90	.2	-	1.2	0.1	-	-	0.2	-	.7	1.6	-	-	-	-
90 and under 95	.9	.2	3.6	-	-	-	-	-	3.6	7.9	-	-	-	-
95 and under 100	4.6	4.1	8.9	-	-	-	-	1.5	5.4	10.7	1.6	-	-	-
100 and under 105	5.9	2.6	18.8	(4/)	-	0.2	-	1.4	6.6	11.7	3.9	-	2.3	-
105 and under 110	2.9	1.5	8.3	-	-	-	-	2.6	5.3	7.2	5.1	1.5	4.2	-
110 and under 115	5.5	3.0	15.3	(4/)	-	.2	-	3.3	11.2	12.1	12.9	6.1	1.5	-
115 and under 120	5.0	4.1	10.6	.5	0.2	1.8	-	1.8	14.3	12.8	23.6	2.0	1.1	-
120 and under 125	3.1	3.4	3.6	.2	-	.2	.3	6.2	6.7	4.9	12.2	2.0	2.7	-
125 and under 130	5.5	6.0	5.9	1.6	-	2.4	2.0	11.3	9.1	4.2	10.9	16.9	3.4	-
130 and under 135	5.9	5.6	10.1	4.6	1.6	5.4	5.8	3.0	4.9	5.4	2.6	7.7	11.1	-
135 and under 140	5.9	6.6	-	2.0	.5	.8	3.5	6.5	9.4	4.0	13.8	14.3	19.3	-
140 and under 145	4.9	4.9	1.8	4.5	9.4	2.7	2.7	4.5	4.9	3.3	4.2	9.7	9.2	9.0
145 and under 150	6.8	4.9	-	6.5	6.2	4.5	7.7	5.3	2.0	1.2	3.2	2.0	6.1	3.4
150 and under 155	3.7	3.7	.6	10.9	3.7	12.3	14.0	3.5	3.1	6.8	-	-	4.6	5.9
155 and under 160	4.5	6.4	-	10.1	2.7	6.1	16.5	2.4	4.4	2.3	3.5	10.2	6.1	3.3
160 and under 165	6.5	5.2	7.1	17.5	16.3	9.7	22.8	20.7	1.5	1.6	1.6	1.0	1.5	5.3
165 and under 170	3.2	4.1	-	9.8	18.6	9.4	5.1	3.6	.9	1.2	.3	1.0	18.1	7.4
170 and under 175	5.0	7.3	-	7.7	13.9	5.6	5.3	1.4	.1	.2	-	-	.8	6.7
175 and under 180	2.0	3.0	-	3.2	4.2	4.8	1.8	11.5	5.3	-	-	25.6	1.1	4.8
180 and under 185	12.6	16.3	-	8.4	1.9	17.0	7.1	9.2	.2	-	.6	-	5.4	9.4
185 and under 190	1.1	1.7	-	5.7	2.4	9.7	5.2	-	-	-	-	-	1.1	14.1
190 and under 195	2.6	3.9	-	.8	.8	2.4	-	.3	-	-	-	-	-	29.7
195 and under 200	1.0	1.3	.6	2.7	7.4	2.7	-	-	-	-	-	-	-	1.0
200 and under 205	.1	-	.6	.8	1.4	1.4	-	-	-	-	-	-	.4	-
205 and under 210	.1	-	.6	.9	3.0	.3	-	-	-	-	-	-	-	-
210 and under 215	.2	-	1.2	.1	.3	-	-	-	-	-	-	-	-	-
215 and under 220	-	-	-	1.4	5.1	-	-	-	-	-	-	-	-	-
220 and under 225	-	-	-	(4/)	.2	-	-	-	-	-	-	-	-	-
225 and under 230	-	-	-	(4/)	.2	-	-	-	-	-	-	-	-	-
230 and under 235	-	-	-	(4/)	-	.2	-	-	-	-	-	-	-	-
235 and under 240	-	-	-	-	-	-	-	-	-	-	-	-	-	-
240 and under 245	-	-	-	(4/)	-	.2	-	-	-	-	-	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of workers	803	534	169	2,366	625	628	1,113	663	936	429	311	196	261	842
Average hourly earnings 1/	$1.44	$1.51	$1.18	$1.63	$1.70	$1.67	$1.58	$1.49	$1.26	$1.17	$1.25	$1.46	$1.46	$1.76

1/ Excludes premium pay for overtime and night work.
2/ Includes data for regions not shown separately by type of system.
3/ Includes data for type of system not shown separately.
4/ Less than 0.05 percent.

TABLE 10: Average straight-time hourly earnings [1] of men in selected plant occupations in electric and gas utilities, by region, July 1952

Occupation	United States [2]		New England		Middle Atlantic		Border States		Southeast	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
ELECTRICITY										
Auxiliary-equipment operators, electric	4,869	$1.72	260	$1.72	1,379	$1.77	288	$1.76	521	$1.62
Boiler operators	5,602	1.94	483	1.85	1,429	2.00	589	1.93	395	1.95
District representatives	2,216	1.88	50	1.71	148	1.93	149	1.60	550	2.01
Groundmen	9,804	1.42	286	1.44	1,326	1.41	963	1.29	1,455	1.27
Linemen, journeymen	15,975	2.07	1,120	1.97	3,400	2.12	860	1.91	1,725	2.02
Load dispatchers	964	2.44	72	2.39	315	2.53	84	2.47	83	2.32
Metermen, class A	2,092	2.01	198	1.84	393	2.11	127	1.98	231	2.08
Metermen, class B	2,128	1.78	255	1.71	422	1.82	164	1.74	152	1.77
Patrolmen	438	1.86	13	1.58	105	1.90	-	-	26	2.03
Servicemen, electrical appliance	2,793	1.86	478	1.80	333	1.95	-	-	351	2.02
Steam-plant operators (single-unit plants)	138	2.27	-	-	-	-	-	-	15	2.14
Steam-plant operator assistants (single-unit plants)	96	1.98	-	-	-	-	-	-	-	-
Substation operators	4,784	1.99	438	1.83	1,173	1.99	373	2.03	-	-
Switchboard operators, class A	2,677	2.06	346	1.83	528	2.20	154	2.10	305	1.97
Switchboard operators, class B	1,328	1.79	159	1.63	-	-	51	1.85	-	-
Trouble men	4,411	2.11	192	2.12	824	2.29	559	1.91	281	2.21
Truck driver-groundmen	3,934	1.66	187	1.64	1,086	1.70	238	1.50	437	1.56
Turbine operators	2,724	1.91	279	1.85	455	1.95	229	1.65	227	1.97
Watch engineers	1,700	2.35	204	2.49	151	2.75	130	2.77	212	2.24
GAS										
Auxiliary-equipment operators, gas production	988	1.78	127	1.70	261	1.95	-	-	-	-
Boiler operators	528	1.67	88	1.67	192	1.76	30	1.41	66	1.21
Drip pumpers	224	1.65	38	1.56	98	1.72	-	-	12	1.34
Engine-room operators	2,052	1.79	55	1.77	434	1.77	-	-	-	-
Gas-main fitters	6,202	1.72	221	1.63	1,381	1.73	359	1.61	367	1.59
Gas-main fitters' helpers	4,212	1.50	152	1.56	863	1.49	331	1.43	203	1.18
Gas makers	789	1.82	163	1.77	295	1.88	27	1.83	83	1.38
Inspectors	336	1.84	-	-	98	1.94	16	1.66	-	-
Installers, gas meter	2,918	1.73	97	1.71	561	1.79	-	-	-	-
Laborers, gas plant	1,826	1.47	268	1.44	870	1.53	-	-	128	.98
Laborers, main installation and service	10,700	1.27	216	1.43	1,608	1.33	648	1.27	1,068	1.01
Repairmen, gas meter	2,085	1.74	113	1.76	531	1.73	150	1.68	124	1.69
Repairmen helpers, gas meter	817	1.47	24	1.51	135	1.48	20	1.40	56	1.19
Servicemen, gas appliance	8,734	1.82	696	1.68	2,170	1.81	-	-	447	1.68
Servicemen, regulator	622	1.92	6	1.70	224	1.95	-	-	27	1.78
ELECTRICITY AND GAS										
Electricians, maintenance	4,076	2.08	403	1.93	860	2.07	243	1.97	377	2.00
Guards	1,298	1.49	92	1.44	260	1.57	-	-	-	-
Janitors	5,526	1.31	426	1.38	1,581	1.41	337	1.18	495	1.00
Machinists, maintenance	1,454	2.07	127	1.92	271	2.12	245	1.94	85	2.15
Maintenance men, general utility	1,558	1.85	112	1.76	458	2.05	193	1.75	93	1.58
Mechanics, automotive	2,753	1.91	185	1.77	765	1.96	231	1.88	157	1.94
Mechanics, maintenance	3,444	1.97	348	1.91	1,035	2.04	283	1.93	342	1.95
Meter readers	10,169	1.55	924	1.47	2,598	1.61	776	1.53	803	1.44
Pipe fitters, maintenance	743	1.99	40	1.85	213	1.97	-	-	-	-
Stock clerks	3,593	1.64	263	1.57	778	1.69	275	1.59	185	1.65
Truck drivers	3,245	1.66	94	1.64	521	1.66	325	1.56	100	1.38
Light trucks (under 1½ tons)	345	1.59	-	-	-	-	-	-	-	-
Medium trucks (1½ to and including 4 tons)	1,942	1.62	77	1.64	311	1.65	154	1.50	-	-
Heavy trucks (over 4 tons, trailer type)	260	1.75	-	-	-	-	-	-	-	-
Heavy trucks (over 4 tons, other than trailer type)	698	1.76	14	1.71	102	1.73	-	-	12	1.36

See footnotes at end of table.

TABLE 10: Average straight-time hourly earnings 1/ of men in selected plant occupations in electric and gas utilities, by region, July 1952 - Continued

Occupation	Great Lakes		Middle West		Southwest		Mountain		Pacific	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
ELECTRICITY										
Auxiliary-equipment operators, electric	1,315	$1.77	372	$1.59	543	$1.59	110	$1.64	81	$2.05
Boiler operators	1,397	2.04	496	1.73	439	1.82	191	1.74	183	2.04
District representatives	343	2.01	518	1.64	343	1.87	91	2.25	24	2.59
Groundmen	1,772	1.50	551	1.32	1,692	1.28	385	1.46	1,374	1.76
Linemen, journeymen	3,612	2.12	1,130	1.83	1,509	1.94	591	2.03	2,028	2.29
Load dispatchers	152	2.54	58	2.12	94	2.22	46	2.12	60	2.74
Metermen, class A	484	2.01	198	1.84	270	1.95	55	2.01	136	2.29
Metermen, class B	617	1.82	119	1.54	166	1.56	74	1.71	159	2.11
Patrolmen	77	1.87	29	1.80	75	1.70	-	-	44	2.12
Servicemen, electrical appliance	847	1.91	366	1.62	-	-	-	-	83	2.08
Steam-plant operators (single-unit plants)	-	-	-	-	-	-	-	-	-	-
Steam-plant operator assistants (single-unit plants)	-	-	-	-	-	-	-	-	-	-
Substation operators	1,553	2.12	107	1.77	217	1.62	104	1.81	434	2.15
Switchboard operators, class A	576	2.15	162	1.90	137	1.94	185	1.92	284	2.21
Switchboard operators, class B	347	1.84	-	-	67	1.69	-	-	179	2.09
Trouble men	974	2.19	229	1.95	717	1.86	241	2.02	394	2.35
Truck driver-groundmen	1,009	1.69	232	1.52	387	1.61	-	-	279	1.96
Turbine operators	694	2.01	379	1.71	182	1.96	108	1.99	171	2.08
Watch engineers	318	2.52	180	1.85	388	2.15	63	2.15	54	2.54
GAS										
Auxiliary-equipment operators, gas production	185	1.82	-	-	-	-	-	-	-	-
Boiler operators	94	1.81	-	-	-	-	-	-	39	1.88
Drip pumpers	23	1.72	-	-	-	-	-	-	-	-
Engine-room operators	382	1.86	-	-	474	1.82	-	-	56	2.04
Gas-main fitters	1,918	1.77	424	1.66	723	1.56	221	1.85	588	1.91
Gas-main fitters' helpers	854	1.57	230	1.50	593	1.27	-	-	803	1.68
Gas makers	133	1.99	22	1.72	-	-	-	-	66	1.87
Inspectors	98	1.85	37	1.74	-	-	-	-	-	-
Installers, gas meter	524	1.73	142	1.79	659	1.50	-	-	514	1.96
Laborers, gas plant	268	1.64	54	1.21	-	-	-	-	117	1.54
Laborers, main installation and service	2,201	1.42	1,404	1.35	2,666	1.07	370	1.38	519	1.57
Repairmen, gas meter	528	1.80	161	1.67	309	1.64	40	1.81	129	1.99
Repairmen helpers, gas meter	219	1.62	50	1.53	208	1.26	-	-	91	1.67
Servicemen, gas appliance	2,621	1.89	742	1.80	674	1.64	-	-	-	-
Servicemen, regulator	120	1.93	25	1.76	96	1.77	12	1.86	82	2.10
ELECTRICITY AND GAS										
Electricians, maintenance	1,165	2.18	222	2.07	328	2.02	113	2.03	365	2.25
Guards	507	1.59	-	-	150	1.16	24	1.34	-	-
Janitors	1,193	1.46	359	1.23	712	1.00	118	1.29	305	1.57
Machinists, maintenance	348	2.14	104	2.07	112	1.89	27	2.00	135	2.22
Maintenance men, general utility	349	1.88	160	1.67	103	1.68	61	1.89	-	-
Mechanics, automotive	819	1.90	104	1.89	213	1.81	68	1.95	211	2.08
Mechanics, maintenance	693	1.96	170	1.85	347	1.92	73	1.96	153	2.08
Meter readers	2,366	1.63	663	1.49	936	1.26	261	1.46	842	1.76
Pipe fitters, maintenance	310	2.09	-	-	-	-	-	-	-	-
Stock clerks	898	1.71	281	1.51	456	1.35	94	1.67	363	1.89
Truck drivers	806	1.76	222	1.59	769	1.55	139	1.72	269	1.92
Light trucks (under 1½ tons)	122	1.61	-	-	38	1.41	-	-	-	-
Medium trucks (1½ to and including 4 tons)	323	1.72	206	1.58	599	1.52	101	1.73	152	1.91
Heavy trucks (over 4 tons, trailer type)	-	-	-	-	59	1.81	-	-	-	-
Heavy trucks (over 4 tons, other than trailer type)	314	1.88	-	-	73	1.65	-	-	-	-

1/ Excludes premium pay for overtime and night work.
2/ Includes data for occupations not shown separately in some regions.

TABLE 11: Average straight-time hourly earnings 1/ of men in selected plant occupations in electric and gas utilities, by region and type of system, July 1952

Occupation	United States 2/						New England			Middle Atlantic		
	Electric systems		Gas systems		Combined systems		Electric systems	Gas systems	Combined systems	Electric systems	Gas systems	Combined systems
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Average hourly earnings					
ELECTRICITY												
Auxiliary-equipment operators, electric	2,649	$1.70	-	-	2,220	$1.74	$1.68	-	$1.83	-	-	-
Boiler operators	2,942	1.94	-	-	2,660	1.93	1.84	-	1.87	$1.96	-	$2.03
District representatives	1,070	1.89	-	-	1,146	1.87	-	-	-	1.87	-	2.05
Groundmen	5,229	1.41	-	-	4,575	1.42	1.43	-	1.44	1.43	-	1.40
Linemen, journeymen	8,448	2.07	-	-	7,527	2.07	1.95	-	1.99	2.06	-	2.18
Load dispatchers	541	2.46	-	-	423	2.40	2.35	-	2.52	2.58	-	2.48
Metermen, class A	1,082	2.03	-	-	1,010	2.00	1.81	-	1.91	2.07	-	2.17
Metermen, class B	974	1.76	-	-	1,154	1.80	1.61	-	1.79	1.73	-	1.90
Patrolmen	193	1.77	-	-	245	1.93	-	-	-	1.60	-	2.05
Servicemen, electrical appliance	1,408	1.89	-	-	1,385	1.82	1.74	-	1.87	-	-	-
Substation operators	2,641	1.96	-	-	2,143	2.03	1.84	-	1.79	1.83	-	2.10
Switchboard operators, class A	1,536	2.04	-	-	1,141	2.08	1.76	-	2.10	2.18	-	2.22
Switchboard operators, class B	782	1.79	-	-	546	1.79	1.53	-	1.81	-	-	-
Trouble men	2,154	2.08	-	-	2,257	2.14	2.12	-	2.13	2.19	-	2.33
Truck driver-groundmen	2,063	1.67	-	-	1,871	1.66	1.65	-	1.62	1.63	-	1.75
Turbine operators	1,285	1.96	-	-	1,439	1.86	1.85	-	1.84	1.86	-	2.01
Watch engineers	916	2.45	-	-	784	2.24	2.47	-	2.54	-	-	-
GAS												
Auxiliary-equipment operators, gas production	-	-	691	$1.74	297	1.87	-	$1.60	1.80	-	-	-
Boiler operators	-	-	326	1.59	202	1.80	-	1.63	1.74	-	$1.67	1.86
Drip pumpers	-	-	105	1.62	119	1.67	-	-	-	-	1.69	1.73
Engine-room operators	-	-	1,666	1.78	386	1.86	-	-	-	-	1.69	2.05
Gas-main fitters	-	-	4,024	1.69	2,178	1.77	-	1.57	1.71	-	-	-
Gas-main fitters' helpers	-	-	2,668	1.45	1,544	1.59	-	-	-	-	-	-
Gas makers	-	-	342	1.74	447	1.87	-	1.70	1.82	-	1.80	1.90
Installers, gas meter	-	-	1,924	1.64	994	1.90	-	-	-	-	1.70	1.87
Laborers, gas plant	-	-	1,091	1.43	735	1.54	-	1.44	1.43	-	1.41	1.59
Laborers, main installation and service	-	-	6,891	1.22	3,809	1.35	-	1.41	1.44	-	-	-
Repairmen, gas meter	-	-	1,276	1.72	809	1.77	-	1.73	1.79	-	-	-
Repairmen helpers, gas meter	-	-	627	1.46	190	1.50	-	-	-	-	1.47	1.52
Servicemen, gas appliance	-	-	5,756	1.80	2,978	1.85	-	1.63	1.78	-	-	-
Servicemen, regulator	-	-	324	1.84	298	2.00	-	-	-	-	-	-
ELECTRICITY AND GAS												
Electricians, maintenance	2,333	2.08	140	1.96	1,603	2.10	1.91	1.75	1.97	2.02	1.88	2.18
Guards	751	1.47	77	1.55	470	1.53	1.41	-	-	1.47	-	-
Janitors	2,096	1.26	897	1.24	2,533	1.38	1.34	1.41	1.47	1.34	1.40	1.43
Machinists, maintenance	622	2.08	227	1.95	605	2.10	1.93	1.69	1.98	2.03	1.95	2.18
Maintenance men, general utility	354	1.84	407	1.81	797	1.88	1.80	1.75	1.75	2.05	-	-
Mechanics, automotive	977	1.91	536	1.84	1,240	1.95	1.76	1.66	1.84	1.80	1.81	2.06
Mechanics, maintenance	1,914	1.99	274	1.80	1,256	1.98	1.85	-	1.97	2.04	-	-
Meter readers	3,465	1.49	2,565	1.54	4,139	1.61	1.41	1.50	1.54	1.52	1.57	1.68
Pipe fitters, maintenance	213	2.14	248	1.82	282	2.02	-	-	1.89	-	1.86	-
Stock clerks	1,311	1.63	710	1.64	1,572	1.65	1.56	1.52	1.63	1.63	-	-
Truck drivers 3/	1,198	1.65	935	1.67	1,112	1.66	1.65	1.54	1.66	-	1.65	-
Medium trucks (1½ to and including 4 tons)	766	1.56	532	1.64	644	1.68	1.67	1.55	1.64	-	1.63	-

See footnotes at end of table.

TABLE 11: Average straight-time hourly earnings 1/ of men in selected plant occupations in electric and gas utilities, by region and type system, July 1952 - Continued

Occupation	Border States: Electric systems	Border States: Gas systems	Border States: Combined systems	Southeast: Electric systems	Southeast: Gas systems	Great Lakes: Electric systems	Great Lakes: Gas systems	Great Lakes: Combined systems	Southwest: Electric systems	Southwest: Gas systems	Southwest: Combined systems
	Average hourly earnings										
ELECTRICITY											
Auxiliary-equipment operators, electric	$1.85	-	$1.66	$1.63	-	$1.80	-	$1.73	$1.51	-	-
Boiler operators	-	-	1.84	1.97	-	2.06	-	2.00	1.72	-	-
District representatives	-	-	-	2.02	-	2.11	-	1.98	1.76	-	-
Groundmen	1.28	-	-	1.29	-	-	-	1.49	1.25	-	$1.37
Linemen, journeymen	1.85	-	-	2.01	-	2.20	-	2.07	1.91	-	-
Load dispatchers	2.43	-	2.53	2.32	-	2.71	-	2.37	2.17	-	2.37
Metermen, class A	1.95	-	2.03	2.09	-	2.15	-	1.96	1.94	-	2.00
Metermen, class B	1.84	-	1.61	1.77	-	1.89	-	1.79	1.46	-	1.75
Patrolmen	-	-	-	-	-	1.85	-	1.88	1.70	-	-
Servicemen, electrical appliance	-	-	-	2.03	-	-	-	1.79	-	-	-
Substation operators	-	-	-	-	-	2.23	-	1.99	1.58	-	-
Switchboard operators, class A	2.11	-	-	1.96	-	2.24	-	2.06	1.85	-	-
Switchboard operators, class B	-	-	1.89	-	-	-	-	-	1.72	-	-
Trouble men	1.77	-	-	2.21	-	2.26	-	2.12	1.88	-	1.82
Truck driver-groundmen	1.51	-	-	1.58	-	1.77	-	1.62	1.43	-	-
Turbine operators	1.67	-	-	2.04	-	2.14	-	1.89	1.89	-	-
Watch engineers	2.92	-	2.64	2.23	-	2.84	-	2.19	2.10	-	-
GAS											
Auxiliary-equipment operators, gas production	-	-	-	-	-	-	$1.82	1.82	-	-	-
Boiler operators	-	-	-	-	$1.12	-	1.80	1.85	-	-	-
Drip pumpers	-	-	-	-	1.35	-	1.74	-	-	-	-
Engine-room operators	-	-	-	-	-	-	1.87	1.86	-	$1.82	-
Gas-main fitters	-	$1.63	1.58	-	-	-	1.79	1.74	-	1.57	-
Gas-main fitters' helpers	-	1.46	-	-	1.16	-	1.56	1.58	-	1.27	-
Gas makers	-	-	1.79	-	1.28	-	2.02	1.94	-	-	-
Installers, gas meter	-	-	-	-	-	-	1.72	1.75	-	1.48	1.65
Laborers, gas plant	-	-	-	-	.95	-	-	-	-	-	-
Laborers, main installation and service	-	1.29	-	-	1.01	-	1.44	1.40	-	1.08	-
Repairmen, gas meter	-	1.67	-	-	1.67	-	1.82	1.76	-	1.63	1.66
Repairmen helpers, gas meter	-	-	1.35	-	1.16	-	1.69	1.41	-	-	1.26
Servicemen, gas appliance	-	-	-	-	1.68	-	1.88	1.91	-	1.64	-
Servicemen, regulator	-	-	-	-	1.84	-	1.84	-	-	1.73	1.86
ELECTRICITY AND GAS											
Electricians, maintenance	1.96	-	1.98	2.01	-	2.22	2.11	2.10	2.00	-	-
Guards	-	-	-	-	-	1.67	1.62	1.46	1.13	-	-
Janitors	1.10	-	1.19	1.00	1.00	1.55	1.39	1.39	.95	1.01	1.11
Machinists, maintenance	1.90	-	1.98	2.16	-	2.25	2.00	2.00	1.86	1.89	-
Maintenance men, general utility	-	-	-	1.59	1.54	1.90	-	1.80	-	1.64	1.98
Mechanics, automotive	-	1.91	1.82	2.01	-	2.00	1.84	1.84	1.78	1.83	1.84
Mechanics, maintenance	1.92	-	2.05	1.94	-	2.05	1.93	1.90	1.88	1.67	2.09
Meter readers	1.50	1.58	1.53	1.51	1.18	1.70	1.67	1.58	1.17	1.25	1.46
Pipe fitters, maintenance	-	-	-	-	-	2.18	2.07	-	-	-	-
Stock clerks	1.54	1.66	1.61	1.74	1.29	1.83	1.70	1.65	1.29	1.40	1.44
Truck drivers 3/	-	1.61	-	1.36	-	1.88	1.88	1.59	1.50	1.59	-
Medium trucks (1½ to and including 4 tons)	-	1.57	1.40	-	-	1.68	1.94	1.62	1.49	1.52	-

1/ Excludes premium pay for overtime and night work.
2/ Includes data for regions not shown separately.
3/ Includes data for types of trucks not shown separately.

TABLE 12: Average straight-time hourly earnings 1/ of men in selected plant occupations in electric and gas utilities, by region and size of system, July 1952

Occupation	United States 2/				New England		Middle Atlantic		Border States	
	Establishment with -									
	101 - 1,000 workers		1,001 or more workers		101 - 1,000 workers	1,001 or more workers	101 - 1,000 workers	1,001 or more workers	101 - 1,000 workers	1,001 or more workers
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Average hourly earnings					
ELECTRICITY										
Auxiliary-equipment operators, electric	680	$1.65	4,189	$1.73	$1.84	$1.67	$1.72	$1.78	$1.76	$1.75
Boiler operators	1,047	1.79	4,555	1.97	1.85	1.85	1.80	2.04	1.87	1.94
District representatives	553	1.78	1,663	1.91	-	1.69	1.79	1.97	-	1.59
Groundmen	1,556	1.38	8,248	1.43	1.48	1.42	1.50	1.40	1.28	1.29
Linemen, journeymen	2,538	1.94	13,437	2.09	1.96	1.97	1.90	2.14	1.92	1.91
Load dispatchers	195	2.15	769	2.51	2.18	2.51	2.20	2.61	2.18	2.64
Metermen, class A	464	1.93	1,628	2.04	1.86	1.81	1.90	2.15	1.89	2.01
Metermen, class B	501	1.63	1,627	1.83	1.67	1.74	1.59	1.89	1.59	1.81
Patrolmen	32	1.93	406	1.85	-	1.52	-	1.91	-	-
Servicemen, electrical appliance	717	1.76	2,076	1.89	1.79	1.81	1.69	2.00	-	-
Substation operators	341	1.81	4,443	2.00	1.78	1.84	1.74	2.01	1.65	2.07
Switchboard operators, class A	448	1.88	2,229	2.09	1.85	1.81	2.01	2.23	1.97	2.11
Switchboard operators, class B	213	1.73	1,115	1.80	1.74	1.54	-	-	-	1.85
Trouble men	901	1.97	3,510	2.15	2.12	2.13	2.11	2.30	1.94	1.90
Truck driver-groundmen	563	1.57	3,371	1.68	1.64	1.64	1.61	1.70	1.45	1.52
Turbine operators	714	1.79	2,010	1.95	1.78	1.87	1.85	1.98	1.63	1.66
Watch engineers	421	2.21	1,279	2.40	2.40	2.66	2.55	2.80	2.47	2.81
GAS										
Auxiliary-equipment operators, gas production	177	1.69	811	1.80	1.68	1.84	-	1.95	-	-
Boiler operators	233	1.51	295	1.80	1.64	1.91	1.59	1.85	1.28	1.58
Drip pumpers	65	1.53	159	1.69	1.54	-	1.60	1.73	-	-
Engine-room operators	304	1.63	1,748	1.82	1.74	1.85	1.66	1.79	-	-
Gas-main fitters	1,127	1.62	5,075	1.74	1.59	1.70	1.55	1.77	1.64	1.60
Gas-main fitters' helpers	835	1.38	3,377	1.53	1.48	1.63	1.35	1.52	1.47	1.40
Gas makers	285	1.66	504	1.91	1.76	1.82	1.66	1.91	-	1.83
Inspectors	49	1.61	287	1.88	-	-	-	1.97	-	1.66
Installers, gas meter	637	1.49	2,281	1.80	1.69	1.79	1.53	1.83	-	-
Laborers, gas plant	634	1.34	1,192	1.54	1.44	-	1.32	1.56	-	-
Laborers, main installation and service	2,608	1.13	8,092	1.31	1.42	1.44	1.27	1.35	1.19	1.28
Repairmen, gas meter	591	1.63	1,494	1.79	1.71	1.96	1.58	1.77	1.78	1.67
Repairmen helpers, gas meter	168	1.34	649	1.50	1.51	-	1.39	1.51	-	1.42
Servicemen, gas appliance	1,872	1.64	6,862	1.87	1.64	1.81	1.60	1.86	-	-
Servicemen, regulator	104	1.74	518	1.96	-	-	1.82	1.99	-	-
ELECTRICITY AND GAS										
Electricians, maintenance	553	1.97	3,523	2.10	1.92	1.94	1.90	2.10	1.98	1.97
Guards	181	1.44	1,117	1.50	1.42	1.45	1.49	1.59	-	-
Janitors	951	1.23	4,575	1.33	1.42	1.35	1.37	1.41	1.13	1.19
Machinists, maintenance	175	1.97	1,279	2.08	1.92	1.92	1.99	2.13	1.85	1.96
Maintenance men, general utility	413	1.68	1,145	1.92	1.75	1.91	1.64	2.11	1.60	1.76
Mechanics, automotive	297	1.77	2,456	1.93	1.74	1.81	1.75	1.97	1.63	1.91
Mechanics, maintenance	584	1.90	2,860	1.99	1.93	1.90	1.84	2.08	1.94	1.93
Meter readers	1,856	1.46	8,313	1.57	1.47	1.47	1.51	1.62	1.42	1.55
Stock clerks	619	1.51	2,974	1.67	1.56	1.57	1.50	1.71	1.50	1.62
Truck drivers	448	1.56	2,797	1.67	1.59	1.68	1.49	1.70	1.59	1.56
Light trucks (under 1½ tons)	38	1.44	307	1.61	-	-	-	-	-	-
Medium trucks (1½ to and including 4 tons)	297	1.56	1,645	1.63	1.58	1.68	1.43	1.69	1.59	1.48
Heavy trucks (over 4 tons, trailer type)	46	1.57	214	1.79	-	-	-	-	-	-
Heavy trucks (over 4 tons, other than trailer type)	67	1.60	631	1.78	1.69	-	1.61	1.75	-	-

See footnotes at end of table.

TABLE 12: Average straight-time hourly earnings 1/ of men in selected plant occupations in electric and gas utilities, by region and size of system, July 1952 - Continued

Occupation	Southeast		Great Lakes		Middle West		Southwest	
	Establishment with -							
	101 - 1,000 workers	1,001 or more workers	101 - 1,000 workers	1,001 or more workers	101 - 1,000 workers	1,001 or more workers	101 - 1,000 workers	1,001 or more workers
	Average hourly earnings							
ELECTRICITY								
Auxiliary-equipment operators, electric	$1.70	$1.60	$1.68	$1.77	$1.44	$1.69	$1.44	$1.60
Boiler operators	1.94	1.95	1.91	2.05	1.58	1.81	1.84	1.82
District representatives	2.01	2.01	1.90	2.06	1.59	1.68	1.75	1.91
Groundmen	1.33	1.26	1.53	1.50	1.22	1.38	1.17	1.30
Linemen, journeymen	2.03	2.02	2.05	2.13	1.66	1.94	1.84	1.96
Load dispatchers	2.58	2.28	2.23	2.57	1.79	2.33	2.05	2.24
Metermen, class A	2.12	2.05	1.94	2.02	1.68	1.91	1.85	1.97
Metermen, class B	1.84	1.75	1.70	1.84	1.44	1.63	1.35	1.63
Patrolmen	-	2.02	-	1.87	-	1.82	-	1.70
Servicemen, electrical appliance	2.01	2.03	1.74	1.94	1.56	1.67	-	-
Substation operators	-	-	1.65	2.13	1.64	1.79	1.53	1.63
Switchboard operators, class A	2.17	1.96	1.87	2.20	1.68	2.02	-	1.94
Switchboard operators, class B	-	-	-	1.84	-	-	1.65	1.74
Trouble men	2.20	2.22	2.11	2.20	1.64	2.11	1.69	1.93
Truck driver-groundmen	1.56	1.57	1.68	1.69	1.37	1.62	1.40	1.65
Turbine operators	2.19	1.92	1.64	2.09	1.58	1.78	1.67	2.01
Watch engineers	2.55	2.18	2.14	2.58	1.73	1.96	2.00	2.17
GAS								
Auxiliary-equipment operators, gas production	-	-	1.73	1.84	-	-	-	-
Boiler operators	1.15	1.34	1.76	1.82	-	-	-	-
Drip pumpers	-	-	-	1.72	-	-	-	-
Engine-room operators	-	-	1.86	1.87	-	-	1.37	1.90
Gas-main fitters	1.69	1.53	1.70	1.78	1.43	1.71	1.49	1.58
Gas-main fitters' helpers	1.20	1.15	1.52	1.58	1.27	1.54	1.16	1.30
Gas makers	1.25	1.60	1.83	2.02	-	1.76	-	-
Inspectors	-	-	-	1.86	1.56	1.85	-	-
Installers, gas meter	-	-	1.70	1.73	-	1.81	1.39	1.62
Laborers, gas plant	1.00	.97	-	1.65	1.13	1.47	-	-
Laborers, main installation and service	.96	1.04	1.39	1.42	1.08	1.43	.94	1.12
Repairmen, gas meter	1.58	1.81	1.70	1.84	1.53	1.71	1.43	1.71
Repairmen helpers, gas meter	1.19	1.18	1.51	1.64	-	1.55	1.04	1.29
Servicemen, gas appliance	1.55	1.78	1.80	1.90	1.63	1.83	1.33	1.71
Servicemen, regulator	-	1.79	-	1.93	-	1.91	1.66	1.83
ELECTRICITY AND GAS								
Electricians, maintenance	2.19	1.98	2.11	2.18	1.77	2.12	1.92	2.03
Guards	-	-	1.51	1.60	-	-	-	1.16
Janitors	1.02	1.00	1.33	1.48	.99	1.30	.99	1.00
Machinists, maintenance	-	2.14	2.22	2.13	-	2.08	-	1.90
Maintenance men, general utility	1.68	1.47	1.66	1.95	1.55	1.75	-	1.67
Mechanics, automotive	2.03	1.93	1.76	1.90	1.56	1.93	1.63	1.83
Mechanics, maintenance	2.15	1.94	1.93	1.97	1.70	1.91	1.72	1.94
Meter readers	1.41	1.46	1.67	1.63	1.31	1.56	1.19	1.27
Stock clerks	1.47	1.72	1.66	1.71	1.35	1.60	1.36	1.35
Truck drivers	1.26	1.40	1.52	1.77	1.38	1.65	1.44	1.56
Light trucks (under 1½ tons)	-	-	-	1.61	-	-	1.46	1.33
Medium trucks (1½ to and including 4 tons)	-	-	1.47	1.73	1.38	1.64	1.40	1.52
Heavy trucks (over 4 tons, trailer type)	-	-	-	-	-	-	-	1.81
Heavy trucks (over 4 tons, other than trailer type)	-	-	-	1.88	-	-	1.50	1.73

1/ Excludes premium pay for overtime and night work.
2/ Includes data for regions not shown separately.

TABLE 13: Average straight-time hourly earnings 1/ of workers in selected office occupations in electric and gas utilities, by region, July 1952

Occupation and sex	United States 2/		New England		Middle Atlantic		Border States		Southeast	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Men										
Bookkeepers, hand	546	$2.02	26	$2.00	48	$2.08	9	$2.01	53	$2.09
Cashiers	337	1.79	-	-	159	1.90	-	-	-	-
Clerks, accounting	3,035	1.72	129	1.52	-	-	149	1.91	286	1.61
Clerks, general	2,051	1.67	-	-	-	-	264	1.54	140	1.61
Clerks, order	262	1.59	-	-	-	-	-	-	-	-
Clerks, payroll	240	1.78	21	1.69	53	1.92	17	1.66	16	1.79
Office boys	667	1.02	40	.91	-	-	75	1.01	19	.97
Tabulating-machine operators	570	1.67	36	1.53	-	-	57	1.57	28	1.56
Women										
Billers, machine (billing machine)	1,094	1.22	129	1.23	-	-	139	1.17	149	1.29
Billers, machine (bookkeeping machine)	206	1.21	-	-	-	-	-	-	25	1.09
Bookkeepers, hand	225	1.50	14	1.50	-	-	26	1.57	52	1.35
Bookkeeping-machine operators, class A	132	1.54	-	-	-	-	-	-	-	-
Bookkeeping-machine operators, class B	212	1.21	-	-	70	1.30	-	-	11	1.04
Calculating-machine operators (Comptometer type)	615	1.38	8	1.43	62	1.31	-	-	-	-
Cashiers	4,465	1.27	263	1.34	585	1.41	310	1.17	578	1.36
Clerks, accounting	4,453	1.28	529	1.29	414	1.44	219	1.27	368	1.46
Clerks, file, class A	269	1.45	7	1.56	-	-	-	-	-	-
Clerks, file, class B	809	1.24	23	1.09	189	1.23	24	1.18	-	-
Clerks, general	3,437	1.32	-	-	-	-	356	1.19	273	1.41
Clerks, order	537	1.30	28	1.33	-	-	-	-	54	1.26
Clerks, payroll	723	1.43	103	1.46	180	1.48	70	1.47	52	1.48
Duplicating-machine operators	116	1.17	-	-	-	-	-	-	11	.95
Key-punch operators	1,242	1.34	105	1.23	318	1.35	81	1.27	35	1.32
Office girls	715	.99	16	.94	293	.93	29	.89	19	.95
Secretaries	2,735	1.71	247	1.62	558	1.79	291	1.73	239	1.74
Stenographers, general	5,605	1.36	322	1.34	1,020	1.38	408	1.31	521	1.43
Stenographers, technical	285	1.73	-	-	-	-	-	-	-	-
Switchboard operators	1,592	1.37	124	1.33	453	1.42	118	1.23	117	1.31
Switchboard operator-receptionists	178	1.22	12	1.12	-	-	-	-	-	-
Tabulating-machine operators	382	1.56	33	1.40	81	1.47	-	-	-	-
Typists, class A	1,105	1.42	44	1.25	321	1.52	-	-	44	1.27
Typists, class B	2,462	1.16	180	1.13	669	1.28	194	1.09	104	1.05

See footnotes at end of table.

TABLE 13: Average straight-time hourly earnings 1/ of workers in selected office occupations in electric and gas utilities, by region, July 1952 - Continued

Occupation and sex	Great Lakes		Middle West		Southwest		Mountain		Pacific	
	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings	Number of workers	Average hourly earnings
Men										
Bookkeepers, hand	113	$2.06	73	$1.91	112	$1.97	-	-	-	-
Cashiers	-	-	-	-	33	1.24	-	-	-	-
Clerks, accounting	408	1.68	254	1.44	619	1.68	268	$1.75	177	$1.97
Clerks, general	311	1.78	166	1.55	390	1.52	-	-	-	-
Clerks, order	137	1.59	29	1.42	34	1.59	-	-	-	-
Clerks, payroll	-	-	30	1.69	44	1.69	15	1.82	-	-
Office boys	232	1.14	25	.96	60	.94	18	1.00	-	-
Tabulating-machine operators	148	1.66	40	1.65	32	1.48	-	-	74	1.85
Women										
Billers, machine (billing machine)	179	1.19	120	1.09	149	1.10	64	1.27	35	1.51
Billers, machine (bookkeeping machine)	-	-	-	-	103	1.19	-	-	-	-
Bookkeepers, hand	-	-	-	-	-	-	-	-	-	-
Bookkeeping-machine operators, class A	51	1.62	-	-	18	1.42	-	-	-	-
Bookkeeping-machine operators, class B	67	1.16	-	-	26	1.05	-	-	-	-
Calculating-machine operators (Comptometer type)	155	1.38	32	1.21	102	1.30	-	-	93	1.76
Cashiers	655	1.43	624	1.03	1,034	1.07	109	1.23	307	1.67
Clerks, accounting	1,373	1.20	551	1.12	689	1.26	139	1.31	171	1.77
Clerks, file, class A	126	1.41	12	1.29	38	1.12	-	-	-	-
Clerks, file, class B	301	1.21	38	1.10	41	.97	-	-	159	1.44
Clerks, general	542	1.40	270	1.15	1,066	1.09	140	1.27	584	1.70
Clerks, order	300	1.32	68	1.33	49	1.24	-	-	-	-
Clerks, payroll	124	1.39	83	1.19	66	1.36	-	-	38	1.71
Duplicating-machine operators	24	1.22	13	.99	18	1.05	-	-	17	1.37
Key-punch operators	303	1.31	111	1.25	105	1.22	17	1.22	167	1.61
Office girls	224	1.10	-	-	61	.94	-	-	32	1.18
Secretaries	483	1.71	143	1.57	486	1.62	35	1.72	253	1.86
Stenographers, general	1,371	1.40	489	1.23	965	1.24	142	1.38	367	1.57
Stenographers, technical	121	1.56	-	-	-	-	-	-	-	-
Switchboard operators	339	1.42	70	1.29	201	1.23	28	1.28	142	1.56
Switchboard operator-receptionists	35	1.32	26	1.04	19	1.09	-	-	23	1.49
Tabulating-machine operators	148	1.57	26	1.53	20	1.36	-	-	-	-
Typists, class A	285	1.36	18	1.26	173	1.31	25	1.37	-	-
Typists, class B	595	1.14	166	1.00	259	1.00	72	1.17	223	1.34

1/ Excludes premium pay for overtime and night work.
2/ Includes data for occupations not shown separately in some regions.

TABLE 14: Minimum entrance rate for groundmen in electric systems: 1/ Percent distribution of plant workers, by region, July 1952

Minimum entrance rate (in cents)	Percent of plant workers in -								
	United States 2/	New England	Middle Atlantic	Border States	Southeast	Great Lakes	Southwest	Mountain	Pacific
75	0.2	-	-	-	1.8	-	-	-	-
Over 75 and under 80	-	-	-	-	-	-	-	-	-
80	-	-	-	-	-	-	-	-	-
Over 80 and under 85	.9	-	-	-	-	-	7.5	-	-
85	.4	-	-	-	-	-	3.3	-	-
Over 85 and under 90	-	-	-	-	-	-	-	-	-
90	2.6	22.8	-	-	-	-	4.7	-	-
Over 90 and under 95	.8	-	-	10.8	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-
Over 95 and under 100	2.1	-	-	-	-	-	17.2	-	-
100	-	-	-	-	-	-	-	-	-
Over 100 and under 105	3.2	-	-	12.8	-	-	18.5	-	-
105	-	-	-	-	-	-	-	-	-
Over 105 and under 110	6.1	-	4.5	20.0	23.1	-	-	-	-
110	-	-	-	-	-	-	-	-	-
Over 110 and under 115	6.3	15.3	8.1	16.0	9.9	0.3	7.5	-	-
115	1.0	-	-	-	-	-	8.6	-	-
Over 115 and under 120	11.4	3.6	4.2	-	42.3	5.1	18.3	31.6	-
120	3.4	-	-	40.4	-	-	-	10.6	-
Over 120 and under 125	3.3	-	6.6	-	6.1	-	-	42.9	-
125	1.9	5.2	-	-	-	4.0	-	-	-
Over 125 and under 130	7.7	-	24.1	-	6.0	7.3	-	8.2	-
130	.7	8.7	-	-	-	-	-	-	-
Over 130 and under 135	5.0	3.0	17.2	-	10.8	-	-	1.7	-
135	-	-	-	-	-	-	-	-	-
Over 135 and under 140	3.6	18.3	9.8	-	-	.7	-	-	-
140	-	-	-	-	-	-	-	-	-
Over 140 and under 145	6.9	2.1	23.0	-	-	-	14.4	-	7.0
145	-	-	-	-	-	-	-	-	-
Over 145 and under 150	9.1	-	-	-	-	32.1	-	-	-
150	.6	-	-	-	-	2.3	-	-	-
Over 150 and under 155	6.1	14.2	-	-	-	17.8	-	-	-
155	.1	-	-	-	-	-	-	5.0	-
Over 155 and under 160	-	-	-	-	-	-	-	-	-
160	-	-	-	-	-	-	-	-	-
Over 160 and under 165	3.5	-	-	-	-	-	-	-	45.6
165	-	-	-	-	-	-	-	-	-
Over 165 and under 170	6.8	-	-	-	-	22.5	-	-	5.4
170	-	-	-	-	-	-	-	-	-
Over 170 and under 175	.6	-	-	-	-	-	-	-	7.9
175	-	-	-	-	-	-	-	-	-
Over 175 and under 180	.2	-	-	-	-	-	-	-	3.2
180	-	-	-	-	-	-	-	-	-
Over 180 and under 185	1.4	-	-	-	-	-	-	-	18.8
185	-	-	-	-	-	-	-	-	-
Over 185 and under 190	.9	-	-	-	-	-	-	-	12.1
No established minimum	3.2	6.8	2.5	-	-	7.9	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1/ Systems providing electric service only.
2/ Includes data for region not shown separately.

TABLE 15: Minimum job rate for groundmen in electric systems: 1/ Percent distribution of plant workers, by region, July 1952

Minimum job rate (in cents)	Percent of plant workers in -								
	United States 2/	New England	Middle Atlantic	Border States	Southeast	Great Lakes	Southwest	Mountain	Pacific
Over 80 and under 85	0.9	-	-	-	-	-	7.5	-	-
85	.2	-	-	-	1.8	-	-	-	-
Over 85 and under 90	-	-	-	-	-	-	-	-	-
90	.2	-	-	-	-	-	-	-	-
Over 90 and under 95	.8	-	-	10.8	-	-	-	-	-
95	1.0	-	-	-	-	-	7.9	-	-
Over 95 and under 100	2.1	-	-	-	-	-	17.2	-	-
100	-	-	-	-	-	-	-	-	-
Over 100 and under 105	3.2	-	-	12.8	-	-	18.6	-	-
105	-	-	-	-	-	-	-	-	-
Over 105 and under 110	7.1	22.8	-	20.0	23.1	-	-	-	-
110	-	-	-	-	-	-	-	-	-
Over 110 and under 115	4.2	7.9	-	16.0	9.9	0.3	7.5	-	-
115	1.0	-	-	-	-	-	8.6	-	-
Over 115 and under 120	10.0	-	4.2	-	42.3	5.1	18.3	-	-
120	3.4	-	-	40.4	-	-	-	10.6	-
Over 120 and under 125	4.8	-	11.1	-	6.1	-	-	62.1	-
125	1.9	5.2	-	-	-	4.0	-	-	-
Over 125 and under 130	3.7	11.0	-	-	6.0	7.3	-	-	-
130	1.5	-	8.1	-	-	-	-	-	-
Over 130 and under 135	9.3	3.0	38.4	-	10.8	-	-	9.9	-
135	-	-	-	-	-	-	-	-	-
Over 135 and under 140	1.2	12.4	-	-	-	.7	-	-	-
140	-	-	-	-	-	-	-	-	-
Over 140 and under 145	2.3	-	2.9	-	-	-	14.4	-	-
145	-	-	-	-	-	-	-	-	-
Over 145 and under 150	15.3	-	32.8	-	-	32.1	-	-	-
150	.6	-	-	-	-	2.3	-	-	-
Over 150 and under 155	8.3	28.8	-	-	-	17.8	-	12.4	7.0
155	-	-	-	-	-	-	-	-	-
Over 155 and under 160	.2	2.1	-	-	-	-	-	-	-
160	-	-	-	-	-	-	-	-	-
Over 160 and under 165	.6	6.8	-	-	-	-	-	-	-
165	.1	-	-	-	-	-	-	5.0	-
Over 165 and under 170	6.3	-	-	-	-	22.5	-	-	-
170	-	-	-	-	-	-	-	-	-
Over 170 and under 175	3.9	-	-	-	-	-	-	-	50.9
175	-	-	-	-	-	-	-	-	-
Over 175 and under 180	.2	-	-	-	-	-	-	-	3.2
180	-	-	-	-	-	-	-	-	-
Over 180 and under 185	2.1	-	-	-	-	-	-	-	26.8
185	-	-	-	-	-	-	-	-	-
Over 185 and under 190	.9	-	-	-	-	-	-	-	12.1
No established minimum	2.7	-	2.5	-	-	7.9	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1/ Systems providing electric service only.
2/ Includes data for region not shown separately.

TABLE 16: Minimum entrance rate for main installation and service laborers in gas systems: 1/
Percent distribution of plant workers, by region, July 1952

Minimum entrance rate (in cents)	Percent of plant workers in -						
	United States 2/	New England	Middle Atlantic	Border States	Southeast	Great Lakes	Southwest
75	1.3	-	3.0	-	-	-	2.7
Over 75 and under 80	1.8	-	-	-	25.4	-	-
80	-	-	-	-	-	-	-
Over 80 and under 85	.1	-	-	-	1.9	-	-
85	.4	-	-	-	5.4	-	-
Over 85 and under 90	.7	-	-	-	10.3	-	-
90	8.4	-	-	-	-	-	33.2
Over 90 and under 95	.6	-	-	3.4	4.3	-	-
95	-	-	-	-	-	-	-
Over 95 and under 100	4.9	-	-	28.6	3.8	-	7.6
100	2.2	-	3.5	-	19.8	-	-
Over 100 and under 105	7.5	-	9.5	-	-	17.4	7.3
105	-	-	-	-	-	-	-
Over 105 and under 110	5.8	-	8.7	-	18.4	-	10.7
110	.8	-	-	-	10.7	-	-
Over 110 and under 115	8.2	-	17.1	-	-	-	18.4
115	2.9	-	-	30.7	-	-	-
Over 115 and under 120	2.6	22.5	3.2	5.4	-	1.9	-
120	4.4	-	17.1	8.6	-	-	-
Over 120 and under 125	.7	7.4	1.6	-	-	-	-
125	4.1	-	16.5	-	-	3.2	-
Over 125 and under 130	4.5	45.9	5.8	-	-	5.6	-
130	-	-	-	-	-	-	-
Over 130 and under 135	.3	6.4	-	-	-	-	-
135	-	--	-	-	-	-	-
Over 135 and under 140	2.3	-	10.9	-	-	-	-
140	4.4	9.1	-	-	-	14.2	-
Over 140 and under 145	10.5	8.7	-	23.3	-	26.8	-
145	-	-	-	-	-	-	-
Over 145 and under 150	9.3	-	3.1	-	-	6.9	-
150	4.6	-	-	-	-	24.0	-
Over 150 and under 155	.5	-	-	-	-	-	-
155	-	-	-	-	-	-	-
Over 155 and under 160	1.1	-	-	-	-	-	-
No established minimum	5.1	-	-	-	-	--	20.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1/ Systems providing gas service only.
2/ Includes data for regions not shown separately.

TABLE 17: Minimum job rate for main installation and service laborers in gas systems: 1/ percent distribution of plant workers, by region, July 1952

Minimum job rate (in cents)	Percent of plant workers in -						
	United States 2/	New England	Middle Atlantic	Border States	South-east	Great Lakes	South-west
75	0.7	-	-	-	-	-	2.7
Over 75 and under 80	.3	-	-	-	4.7	-	-
80	-	-	-	-	-	-	-
Over 80 and under 85	1.6	-	-	-	22.6	-	-
85	.4	-	-	-	5.4	-	-
Over 85 and under 90	.7	-	-	-	10.3	-	-
90	7.9	-	-	-	-	-	31.3
Over 90 and under 95	1.1	-	-	3.4	4.3	-	1.9
95	-	-	-	-	-	-	-
Over 95 and under 100	4.9	-	-	28.6	3.8	-	7.6
100	2.3	-	4.3	-	19.8	-	-
Over 100 and under 105	5.5	-	-	-	-	17.4	7.3
105	-	-	-	-	-	-	-
Over 105 and under 110	4.0	-	-	-	18.4	-	10.7
110	.8	-	-	-	10.7	-	-
Over 110 and under 115	9.3	-	22.1	-	-	-	18.4
115	2.9	-	-	30.7	-	-	-
Over 115 and under 120	-	-	-	-	-	-	-
120	-	-	-	-	-	-	-
Over 120 and under 125	2.4	7.4	9.8	-	-	-	-
125	-	-	-	-	-	-	-
Over 125 and under 130	6.7	22.5	17.1	14.0	-	3.5	-
130	-	-	-	-	-	-	-
Over 130 and under 135	1.4	22.3	-	-	-	1.9	-
135	-	-	-	-	-	-	-
Over 135 and under 140	3.8	-	15.3	-	-	3.2	-
140	2.7	-	-	-	-	14.2	-
Over 140 and under 145	7.9	38.7	10.9	23.3	-	8.2	-
145	1.2	-	-	-	-	-	-
Over 145 and under 150	11.4	-	3.1	-	-	27.6	-
150	.4	9.1	-	-	-	-	-
Over 150 and under 155	4.0	-	16.5	-	-	-	-
155	-	-	-	-	-	-	-
Over 155 and under 160	1.1	-	-	-	-	-	-
160	-	-	-	-	-	-	-
Over 160 and under 165	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-
Over 165 and under 170	9.3	-	-	-	-	24.0	-
No established minimum	5.3	-	.9	-	-	-	20.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1/ Systems providing gas service only.
2/ Includes data for regions not shown separately.

TABLE 18: Minimum entrance rates for groundmen and for main installation and service laborers in combined systems: 1/ Percent distribution of plant workers, by region, July 1952

Minimum entrance rate (in cents)	Percent of plant workers in -							
	United States 2/		New England		Middle Atlantic		Great Lakes	
	Groundmen	Laborers, main installation and service	Groundmen	Laborers, main installation and service	Groundmen	Laborers, main installation and service	Groundmen	Laborers, main installation and service
75	-	0.8	-	-	-	-	-	-
Over 75 and under 80	-	-	-	-	-	-	-	-
80	-	.2	-	-	-	-	-	-
Over 80 and under 85	-	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-
Over 85 and under 90	-	.8	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-
Over 90 and under 95	-	2.5	-	-	-	-	-	-
95	0.6	-	-	-	-	-	-	-
Over 95 and under 100	1.3	.8	-	-	-	-	-	-
100	.2	2.5	3.8	3.8	-	-	-	9.1
Over 100 and under 105	3.1	4.2	-	-	8.9	8.9	-	-
105	1.8	1.6	-	3.5	-	-	-	-
Over 105 and under 110	1.6	6.6	16.0	-	-	12.6	-	-
110	.8	.1	-	-	-	-	-	-
Over 110 and under 115	.2	3.2	-	36.5	-	-	-	-
115	2.0	2.4	-	-	-	-	9.0	9.0
Over 115 and under 120	3.0	.9	20.5	-	-	1.4	-	-
120	-	.4	-	-	-	-	-	-
Over 120 and under 125	27.5	27.7	-	-	74.2	67.2	-	3.6
125	2.9	-	-	-	-	-	-	-
Over 125 and under 130	3.2	6.0	14.1	6.9	-	-	2.8	25.0
130	.6	.6	-	-	1.8	1.8	-	-
Over 130 and under 135	1.2	4.6	-	-	-	-	-	7.2
135	2.7	-	-	-	5.6	-	3.6	-
Over 135 and under 140	13.3	6.8	-	-	-	8.1	30.7	11.6
140	1.1	1.0	-	-	-	-	-	1.9
Over 140 and under 145	7.4	4.6	17.2	28.1	8.1	-	7.8	-
145	.7	.7	-	-	-	-	3.3	3.3
Over 145 and under 150	4.6	5.4	-	10.4	-	-	21.2	22.2
150	-	-	-	-	-	-	-	-
Over 150 and under 155	2.7	8.5	21.4	-	-	-	7.2	5.8
155	2.1	-	-	-	-	-	-	-
Over 155 and under 160	10.6	.5	-	7.0	-	-	14.4	-
160	-	-	-	-	-	-	-	-
Over 160 and under 165	.2	-	-	-	-	-	-	-
No established minimum	.8	2.7	7.0	3.8	1.4	-	-	1.3
Information not available	3.8	3.9	-	-	-	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

See footnotes at end of table.

TABLE 18: Minimum entrance rates for groundmen and for main installation and service laborers in combined systems: 1/ Percent distribution of plant workers, by region, July 1952 - Continued

Minimum entrance rate (in cents)	Percent of plant workers in -					
	Middle West		Southwest		Mountain	
	Groundmen	Laborers, main installation and service	Groundmen	Laborers, main installation and service	Groundmen	Laborers, main installation and service
75	-	-	-	17.8	-	-
Over 75 and under 80	-	-	-	-	-	-
80	-	2.0	-	-	-	-
Over 80 and under 85	-	-	-	-	-	-
85	-	-	-	-	-	-
Over 85 and under 90	-	-	-	-	-	-
90	-	-	-	-	-	-
Over 90 and under 95	-	4.8	-	-	-	-
95	-	-	13.4	-	-	-
Over 95 and under 100	12.4	7.4	-	-	-	-
100	-	3.0	-	-	-	-
Over 100 and under 105	-	4.2	-	15.0	-	-
105	8.9	-	15.0	-	-	-
Over 105 and under 110	-	-	-	-	-	-
110	-	-	17.8	-	-	-
Over 110 and under 115	1.9	1.9	-	23.0	-	-
115	-	3.5	-	-	-	-
Over 115 and under 120	-	-	-	-	-	-
120	-	3.6	-	-	-	-
Over 120 and under 125	5.0	23.6	-	-	-	38.5
125	-	-	-	-	18.8	-
Over 125 and under 130	13.1	1.5	-	-	-	-
130	-	-	-	-	-	-
Over 130 and under 135	-	10.8	-	-	-	12.2
135	-	-	-	-	-	-
Over 135 and under 140	31.3	-	30.8	30.8	50.7	-
140	-	-	23.0	-	-	18.8
Over 140 and under 145	8.1	19.3	-	-	30.5	30.5
145	-	-	-	-	-	-
Over 145 and under 150	-	-	-	-	-	-
150	-	-	-	-	-	-
Over 150 and under 155	-	-	-	-	-	-
155	19.3	-	-	-	-	-
Over 155 and under 160	-	-	-	-	-	-
160	-	-	-	-	-	-
Over 160 and under 165	-	-	-	-	-	-
No established minimum	-	14.4	-	13.4	-	-
Information not available	-	-	-	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0

1/ Systems providing both electric and gas services.
2/ Includes data for regions not shown separately.

TABLE 19: Minimum job rates for groundmen and for main installation and service laborers in combined systems: 1/ Percent distribution of plant workers, by region, July 1952

Minimum job rate (in cents)	Percent of plant workers in -							
	United States 2/		New England		Middle Atlantic		Great Lakes	
	Groundmen	Laborers, main installation and service	Groundmen	Laborers, main installation and service	Groundmen	Laborers, main installation and service	Groundmen	Laborers, main installation and service
75	-	0.8	-	-	-	-	-	-
Over 75 and under 80	-	-	-	-	-	-	-	-
80	-	.2	-	-	-	-	-	-
Over 80 and under 85	-	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-
Over 85 and under 90	-	.8	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-
Over 90 and under 95	-	2.5	-	-	-	-	-	-
95	0.6	-	-	-	-	-	-	-
Over 95 and under 100	1.3	.8	-	-	-	-	-	-
100	.2	2.5	3.8	3.8	-	-	-	9.1
Over 100 and under 105	3.1	4.2	-	-	8.9	8.9	-	-
105	1.8	-	-	-	-	-	-	-
Over 105 and under 110	.8	2.3	-	-	-	-	-	-
110	.8	1.7	-	3.5	-	-	-	-
Over 110 and under 115	.2	2.1	-	20.5	-	-	-	-
115	2.0	2.0	-	-	-	-	9.0	9.0
Over 115 and under 120	3.0	.2	20.5	-	-	-	-	-
120	-	.4	-	-	-	-	-	-
Over 120 and under 125	23.2	29.4	-	-	61.6	74.2	-	3.6
125	2.3	.9	-	-	-	1.4	-	-
Over 125 and under 130	2.2	6.8	3.8	22.9	-	-	2.8	25.0
130	.6	.6	-	-	1.8	1.8	-	-
Over 130 and under 135	.6	6.0	3.5	-	-	5.6	-	7.2
135	5.7	-	-	-	12.6	-	3.6	-
Over 135 and under 140	12.5	4.4	16.0	-	-	-	30.7	11.6
140	1.1	.4	-	-	-	-	-	1.9
Over 140 and under 145	4.1	6.6	6.9	10.9	-	8.1	7.8	-
145	2.0	.7	-	-	-	-	3.3	3.3
Over 145 and under 150	8.4	6.5	17.2	27.6	8.1	-	21.2	22.2
150	1.9	-	-	-	5.6	-	-	-
Over 150 and under 155	3.1	8.5	21.3	-	-	-	7.2	5.8
155	2.1	-	-	-	-	-	-	-
Over 155 and under 160	11.6	1.5	-	7.0	-	-	14.4	-
160	-	-	-	-	-	-	-	-
Over 160 and under 165	-	.6	-	-	-	-	-	-
165	-	-	-	-	-	-	-	-
Over 165 and under 170	.2	-	-	-	-	-	-	-
No established minimum	.8	2.7	7.0	3.8	1.4	-	-	1.3
Information not available ...	3.8	3.9	-	-	-	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

See footnotes at end of table.

TABLE 19: Minimum job rates for groundmen and for main installation and service laborers in combined systems: 1/ Percent distribution of plant workers, by region, July 1952 - Continued

Minimum job rate (in cents)	Percent of plant workers in -					
	Middle West		Southwest		Mountain	
	Groundmen	Laborers, main installation and service	Groundmen	Laborers, main installation and service	Groundmen	Laborers, main installation and service
75	-	-	-	17.8	-	-
Over 75 and under 80	-	-	-	-	-	-
80	-	2.0	-	-	-	-
Over 80 and under 85	-	-	-	-	-	-
85	-	-	-	-	-	-
Over 85 and under 90	-	-	-	-	-	-
90	-	-	-	-	-	-
Over 90 and under 95	-	4.8	-	-	-	-
95	-	-	13.4	-	-	-
Over 95 and under 100	12.4	7.4	-	-	-	-
100	-	3.0	-	-	-	-
Over 100 and under 105	-	4.2	-	15.0	-	-
105	8.9	-	15.0	-	-	-
Over 105 and under 110	-	-	-	-	-	-
110	-	-	17.8	-	-	-
Over 110 and under 115	1.9	-	-	23.0	-	-
115	-	-	-	-	-	-
Over 115 and under 120	-	1.9	-	-	-	-
120	-	3.5	-	-	-	-
Over 120 and under 125	5.0	23.6	-	-	-	-
125	-	3.6	-	-	-	-
Over 125 and under 130	13.1	1.5	-	-	-	-
130	-	-	-	-	-	-
Over 130 and under 135	-	10.8	-	-	-	38.5
135	-	-	-	-	18.8	-
Over 135 and under 140	31.3	-	30.8	30.8	-	12.2
140	-	-	23.0	-	-	-
Over 140 and under 145	8.1	19.3	-	-	-	-
145	-	-	-	-	38.5	-
Over 145 and under 150	-	-	-	-	-	-
150	-	-	-	-	-	-
Over 150 and under 155	-	-	-	-	12.2	-
155	19.3	-	-	-	-	-
Over 155 and under 160	-	-	-	-	30.5	30.5
160	-	-	-	-	-	-
Over 160 and under 165	-	-	-	-	-	18.8
165	-	-	-	-	-	-
Over 165 and under 170	-	-	-	-	-	-
No established minimum	-	14.4	-	13.4	-	-
Information not available	-	-	-	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0

1/ Systems providing both electric and gas services.
2/ Includes data for regions not shown separately.

TABLE 20: Scheduled weekly hours of first-shift workers: Percent distribution of workers in electric and gas utilities, by region, July 1952

Weekly hours	Percent of workers in -									
	United States	New England	Middle Atlantic	Border States	South-east	Great Lakes	Middle West	South-west	Moun-tain	Pacific
Plant - Men										
40 hours	96.9	98.5	99.6	100.0	97.7	99.9	85.9	84.0	100.0	100.0
42 hours	.1	1.5	-	-	-	.1	-	-	-	-
44 hours	2.1	-	.4	-	2.3	-	13.1	9.0	-	-
45 hours	.3	-	-	-	-	-	-	2.3	-	-
48 hours	.6	-	-	-	-	-	1.0	4.7	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Office - Women										
35 hours	.3	-	-	-	3.3	-	-	-	-	-
37½ hours	7.1	3.8	25.6	-	14.3	-	-	-	-	-
38½ hours	.3	-	-	-	-	-	4.2	-	-	-
38 3/4 hours	1.4	-	-	20.2	-	-	-	-	-	-
40 hours	89.7	96.2	74.4	79.8	81.3	99.8	83.4	99.0	100.0	100.0
42 hours	.1	-	-	-	-	.2	-	-	-	-
44 hours	1.1	-	-	-	1.1	-	12.4	1.0	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 21: Shift differential practices: Percent distribution of plant workers in electric and gas utilities, by region, July 1952

Shift differential	Percent of plant workers in -									
	United States	New England	Middle Atlantic	Border States	South-east	Great Lakes	Middle West	South-west	Moun-tain	Pacific
Workers on second shift	7.1	10.3	4.9	9.1	8.8	9.1	7.1	4.1	4.1	7.3
Receiving shift differentials	5.0	7.7	4.8	8.3	.1	8.2	4.3	.3	-	4.3
Uniform cents (per hour)	4.5	5.4	3.7	7.2	.1	8.2	4.3	.3	-	4.3
2 and under 4 cents	.5	-	.2	1.7	-	1.1	.2	-	-	-
4 cents	1.1	2.6	.9	.7	.1	1.4	.4	.2	-	2.9
5 cents	1.3	-	.7	4.4	(1/)	2.7	1.1	-	-	1.0
6 cents	.3	.9	.1	-	-	.9	-	.1	-	-
7 and under 8 cents	.2	.9	.6	-	-	-	-	-	-	.4
8 and under 9 cents	.2	-	.2	.4	-	.3	-	-	-	-
9 cents	.4	-	1.0	-	-	-	2.2	-	-	-
10 cents	.5	1.0	-	-	-	1.8	.4	-	-	-
Uniform percentage	.4	-	1.1	1.1	-	-	-	-	-	-
5 percent	.3	-	1.0	-	-	-	-	-	-	-
Over 5 and under 7.5 percent	.1	-	-	1.1	-	-	-	-	-	-
7.5 percent	(1/)	-	.1	-	-	-	-	-	-	-
Other	.1	2.3	-	-	-	-	-	-	-	-
Receiving no differential	2.1	2.6	.1	.8	8.7	.9	2.8	3.8	4.1	3.0
Workers on third shift	6.2	8.9	4.5	7.4	8.5	8.2	6.0	3.8	3.8	5.5
Receiving shift differentials	4.4	6.3	4.4	6.6	.1	7.5	3.3	.3	-	3.4
Uniform cents (per hour)	3.9	4.6	3.5	6.0	.1	7.5	3.3	.3	-	3.4
2 and under 4 cents	.1	-	.2	.2	-	.3	(1/)	-	-	-
4 cents	(1/)	-	-	-	-	.1	.2	-	-	-
5 cents	.7	-	.7	3.5	(1/)	.9	-	-	-	-
6 cents	1.3	2.3	.9	.7	.1	2.3	-	.2	-	2.8
7 and under 8 cents	.2	.2	.6	-	-	-	.5	-	-	-
8 cents	.5	1.0	-	-	-	1.7	.8	-	-	.2
9 cents	.3	.1	.8	1.4	-	-	-	-	-	-
10 cents	.7	1.0	.1	-	-	2.0	1.7	-	-	.4
Over 10 cents	.1	-	.2	.2	-	.2	.1	.1	-	-
Uniform percentage	.4	-	.9	.6	-	-	-	-	-	-
5 percent	.2	-	.6	-	-	-	-	-	-	-
Over 5 and under 7.5 percent	.1	-	-	.6	-	-	-	-	-	-
7.5 percent	.1	-	.3	-	-	-	-	-	-	-
Other	.1	1.7	-	-	-	-	-	-	-	-
Receiving no differential	1.8	2.6	.1	.8	8.4	.7	2.7	3.5	3.8	2.1

1/ Less than 0.05 percent.

TABLE 22: Formal provisions for paid vacations: Percent distribution of workers in electric and gas utilities, by region, July 1952

Vacation policy	Percent of workers in -									
	United States	New England	Middle Atlantic	Border States	Southeast	Great Lakes	Middle West	Southwest	Mountain	Pacific
Plant workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 year's service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	41.1	10.8	42.6	56.7	3.8	49.6	67.7	18.0	28.9	69.6
Over 1 and under 2 weeks	.1	-	-	-	1.4	-	-	-	-	-
2 weeks	58.7	89.2	57.4	43.3	94.8	50.4	32.3	82.0	66.3	30.4
Over 2 and under 3 weeks	.1	-	-	-	-	-	-	-	4.8	-
2 years' service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	10.3	-	13.4	17.1	-	20.3	8.4	1.2	-	-
2 weeks	89.6	100.0	86.6	82.9	100.0	79.7	91.6	98.8	95.2	100.0
Over 2 and under 3 weeks	.1	-	-	-	-	-	-	-	4.8	-
15 years' service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2 weeks	21.4	6.3	5.3	18.2	68.8	13.3	31.2	58.3	46.6	-
Over 2 and under 3 weeks	5.3	-	-	-	3.9	14.4	-	1.8	4.8	15.7
3 weeks	73.2	93.7	94.7	81.8	26.6	72.3	68.8	39.9	48.6	84.3
Over 3 weeks	.1	-	-	-	.7	-	-	-	-	-
Office workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 year's service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	30.0	8.4	20.5	26.9	-	38.9	68.1	8.8	23.2	73.8
Over 1 and under 2 weeks	.1	-	-	-	1.5	-	-	-	-	-
2 weeks	69.8	91.6	79.5	73.1	98.5	61.1	31.9	91.2	73.2	26.2
Over 2 and under 3 weeks	.1	-	-	-	-	-	-	-	3.6	-
2 years' service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	7.2	-	6.4	5.5	-	18.5	8.8	-	-	-
2 weeks	92.7	100.0	93.6	94.5	100.0	81.5	91.2	100.0	96.4	100.0
Over 2 and under 3 weeks	.1	-	-	-	-	-	-	-	3.6	-
15 years' service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2 weeks	20.6	4.8	4.7	16.5	72.7	9.3	31.3	60.1	58.3	-
Over 2 and under 3 weeks	6.3	-	-	-	5.1	14.1	-	1.6	3.6	21.3
3 weeks	73.1	95.2	95.3	83.5	22.2	76.6	68.7	38.3	38.1	78.7

TABLE 23: Formal provisions for paid holidays: Percent distribution of workers in electric and gas utilities, by region, July 1952

Number of paid holidays	Percent of workers in -									
	United States	New England	Middle Atlantic	Border States	Southeast	Great Lakes	Middle West	Southwest	Mountain	Pacific
Plant workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Workers in establishments having paid holidays	99.9	100.0	100.0	100.0	100.0	100.0	99.1	100.0	100.0	100.0
4 days	.2	-	.5	-	1.2	-	-	-	-	-
5 days	3.3	-	-	-	27.5	-	-	10.8	-	-
5½ days	.6	-	-	-	2.8	-	-	3.2	-	-
6 days	26.0	-	.4	20.8	57.0	48.7	19.3	64.2	-	-
7 days	16.4	-	1.1	20.0	11.5	29.4	47.2	11.4	45.7	14.5
8 days	22.5	21.0	26.3	32.9	-	3.5	24.5	10.4	45.8	85.5
9 days	9.2	15.4	13.3	2.2	-	18.4	-	-	8.5	-
10 days	8.7	44.1	13.4	24.1	-	-	8.1	-	-	-
11 days	9.8	19.5	32.8	-	-	-	-	-	-	-
12 days	3.2	-	12.2	-	-	-	-	-	-	-
Having no paid holidays	.1	-	-	-	-	-	.9	-	-	-
Office workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Workers in establishments having paid holidays	100.0	100.0	100.0	100.0	100.0	100.0	99.4	100.0	100.0	100.0
4 days	.1	-	-	-	.9	-	-	-	-	-
5 days	3.1	-	-	-	26.7	-	-	10.1	-	-
5½ days	.5	-	-	-	4.1	-	-	1.6	-	-
6 days	24.5	-	.6	3.1	56.4	44.5	18.5	62.3	-	-
7 days	17.3	-	1.2	17.9	11.9	31.4	43.1	14.4	58.4	13.6
7½ days	.7	-	-	10.9	-	-	-	-	-	-
8 days	21.9	24.1	18.2	41.2	-	3.6	27.4	11.6	34.8	86.4
9 days	8.7	10.6	10.1	2.5	-	20.5	-	-	6.8	-
10 days	8.6	43.2	15.4	24.4	-	-	10.4	-	-	-
11 days	11.9	22.1	43.5	-	-	-	-	-	-	-
12 days	2.7	-	11.0	-	-	-	-	-	-	-
Having no paid holidays	(1/)	-	-	-	-	-	.6	-	-	-

1/ Less than 0.05 percent.

TABLE 24: Nonproduction bonus plans: Percent distribution of workers in electric and gas utilities, by region, July 1952

Type of bonus	Percent of workers in -									
	United States	New England	Middle Atlantic	Border States	South-east	Great Lakes	Middle West	South-west	Moun-tain	Pacific
Plant workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Workers in establishments having nonproduction bonus plans 1/	10.9	31.1	6.4	4.8	12.3	8.8	-	14.9	47.9	11.7
Christmas or year-end	9.5	23.7	6.4	1.2	12.3	8.8	-	12.6	31.7	11.7
Profit-sharing	.4	-	-	-	-	-	-	-	16.2	-
Other	1.0	7.4	-	3.6	-	-	-	2.3	-	-
Having no nonproduction bonus plan	89.1	68.9	93.6	95.2	87.7	91.2	100.0	85.1	52.1	88.3
Office workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Workers in establishments having nonproduction bonus plans 1/	11.1	29.5	7.8	5.6	10.4	8.6	-	11.5	55.9	14.2
Christmas or year-end	9.8	22.5	7.8	1.1	10.4	8.6	-	9.3	44.6	14.2
Profit-sharing	.3	-	-	-	-	-	-	-	11.3	-
Other	1.0	7.0	-	4.5	-	-	-	2.2	-	-
Having no nonproduction bonus plan	88.9	70.5	92.2	94.4	89.6	91.4	100.0	88.5	44.1	85.8

1/ Unduplicated total.

TABLE 25: Insurance and pension plans: Percent distribution of workers in electric and gas utilities, by region, July 1952

Type of plan	Percent of workers in -									
	United States	New England	Middle Atlantic	Border States	Southeast	Great Lakes	Middle West	Southwest	Mountain	Pacific
Plant workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Workers in establishments having insurance or pension plans 1/	99.9	100.0	99.7	100.0	100.0	100.0	100.0	100.0	99.3	100.0
Health insurance	68.2	84.1	72.4	61.3	52.5	74.9	78.8	58.9	94.3	39.0
Hospitalization	56.2	73.2	32.0	49.5	60.1	69.8	50.6	82.3	94.3	39.0
Life insurance	97.8	98.8	97.9	100.0	82.0	100.0	97.3	100.0	99.3	98.7
Retirement pension	94.4	98.8	96.0	91.4	89.4	99.5	86.7	92.5	69.3	96.1
Having no insurance or pension plan	.1	-	.3	-	-	-	-	-	.7	-
Office workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Workers in establishments having insurance or pension plans 1/	99.9	100.0	99.8	100.0	100.0	100.0	100.0	100.0	99.7	100.0
Health insurance	68.0	83.6	72.3	60.9	54.1	77.0	80.3	53.5	95.6	43.8
Hospitalization	58.9	74.6	37.4	50.8	59.5	73.7	49.1	76.4	95.6	43.8
Life insurance	98.4	99.3	98.7	100.0	84.9	100.0	98.0	100.0	99.7	99.6
Retirement pension	95.5	99.3	96.1	94.9	85.6	99.8	91.1	93.4	77.8	97.2
Having no insurance or pension plan	.1	-	.2	-	-	-	-	-	.3	-

1/ Unduplicated total.

TABLE 26: Formal provisions for paid sick leave after 1 year of service: Percent distribution of workers in electric and gas utilities, by region, July 1952

Length of paid sick leave	Percent of workers in -									
	United States	New England	Middle Atlantic	Border States	Southeast	Great Lakes	Middle West	Southwest	Mountain	Pacific
Plant workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Workers in establishments granting leave without waiting period or reduced pay	63.3	75.1	51.3	64.0	81.1	66.3	61.0	43.7	86.7	90.2
3 days	1.9	-	7.3	-	-	-	-	-	-	-
4 days	.9	-	3.3	-	-	-	-	-	-	-
5 days	22.3	39.9	29.5	41.7	7.4	22.3	18.0	3.2	54.0	-
6 days	1.8	-	5.2	-	-	.3	-	-	6.5	1.8
7 days	.2	-	-	-	.7	.6	-	-	-	-
8 days	.1	-	-	-	-	-	-	-	1.9	1.1
10 days	17.7	23.4	1.3	-	69.9	5.4	24.3	22.1	.7	67.6
11 days	.7	-	-	8.5	-	-	-	-	-	-
12 days	2.1	-	-	11.5	-	-	8.4	3.0	-	4.0
13 days	.2	-	-	-	3.1	-	-	-	-	-
14 days	.4	-	-	-	-	-	5.6	-	-	-
15 days	2.7	1.2	.5	-	-	2.1	-	4.6	7.4	15.7
16 days	.3	-	-	-	-	-	4.7	-	-	-
20 days	5.0	7.3	4.2	-	-	13.5	-	2.2	-	-
21 days	3.2	-	-	-	-	13.6	-	-	-	-
22 days	.4	-	-	-	-	-	-	3.2	-	-
30 days	2.6	-	-	2.3	-	8.5	-	-	16.2	-
Over 30 days	.8	3.3	-	-	-	-	-	5.4	-	-
Workers in establishments granting leave after waiting period or with reduced pay	13.6	-	13.7	28.6	.6	20.6	22.3	4.7	-	9.8
No paid sick leave	23.1	24.9	35.0	7.4	18.3	13.1	16.7	51.6	13.3	-
Office workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Workers in establishments granting leave without waiting period or reduced pay	67.5	76.1	67.5	58.5	67.5	70.9	81.7	30.8	79.3	94.2
3 days	1.2	-	5.1	-	-	-	-	-	-	-
4 days	1.3	-	5.4	-	-	-	-	-	-	-
5 days	22.2	40.1	34.2	33.8	3.7	24.8	12.1	1.6	55.9	2.3
6 days	2.1	-	7.3	-	-	.5	-	-	3.5	1.5
7 days	.4	-	-	-	.8	1.0	2.5	-	-	-
8 days	.1	-	-	-	-	-	-	-	2.1	1.0
10 days	17.7	27.8	1.9	-	52.1	4.7	26.6	22.6	.3	65.8
11 days	1.8	-	4.1	11.5	-	-	-	-	-	-
12 days	1.7	-	-	10.7	-	-	12.2	-	-	2.3
14 days	.7	-	1.2	-	-	-	6.4	-	-	-
15 days	4.0	.7	.3	-	-	.5	18.4	3.5	6.2	21.3
16 days	.2	-	-	-	-	-	3.5	-	-	-
20 days	5.6	7.5	2.4	-	-	17.9	-	-	-	-
21 days	3.4	-	-	-	-	13.1	-	-	-	-
22 days	1.0	-	2.4	-	-	-	-	3.1	-	-
25 days	.3	-	1.2	-	-	-	-	-	-	-
30 days	3.3	-	-	2.5	10.9	8.4	-	-	11.3	-
Over 30 days	.5	-	2.0	-	-	-	-	-	-	-
Workers in establishments granting leave after waiting period or with reduced pay	7.2	-	6.7	26.6	-	13.5	.8	-	-	3.0
No paid sick leave	25.3	23.9	25.8	14.9	32.5	15.6	17.5	69.2	20.7	2.8

APPENDIX A

Scope and Method of Study

Hourly Rates or Earnings

The wages presented consist of hourly rates (average straight-time hourly earnings for piece-rate and other incentive workers), excluding premium overtime and shift differential payments. Incentive earnings and cost-of-living bonuses were included as part of the worker's regular pay, but nonincentive payments, such as Christmas bonuses, were excluded. The hourly earnings of salaried workers were obtained by dividing their straight-time salary by normal rather than by actual hours. 1/

Workers and Occupations Covered by the Study

Wage data were not collected for administrative, executive, and professional employees, although such persons are included in the employment totals reported for the industry in table 1. The frequency distribution of workers by average hourly earnings includes all plant (nonoffice) workers except those engaged in allied services such as water, steam heat and power, or urban transportation.

Occupations selected for study were chosen for their numerical importance, their benchmark value in collective bargaining, or their representativeness of the entire rate range in the industry. Inexperienced workers, apprentices, and handicapped workers were not reported in the selected occupations.

The terms "occupation" and "job" in this report refer to the occupational classifications used by the Bureau in Industry Wage Studies. 2/

Employment

Except in one instance (the information regarding the sample in table 1), the number of workers presented is the estimated employment of all establishments within the scope of the survey, rather than employment in the establishments actually studied. Workers on all shifts are included in the employment data, although the wage rates exclude extra pay for late-shift work.

Vacation Plans

The information on vacations is confined to formal plans. It excludes informal arrangements whereby workers may be given vacations at the discretion of their supervisors.

1/ Average hourly rates or earnings for each occupation or other group of workers were obtained by weighting each rate (or hourly earning) by the number of workers receiving the rate.

2/ Copies of the occupational descriptions used in the survey are available on request.

Insurance and Pension Plans and Nonproduction Bonuses

Employees of establishments providing more than one type of insurance or nonproduction bonus are reported for each type of plan. This is contrary to the procedure used in reporting other wage and related practices in which establishments have been classified according to their predominant practice. Thus, the total percentages of employees in establishments with any such plan or bonus may be smaller than the sum of the entries for each type. Only plans for which employers pay at least part of the cost are included.

Method of Study

Data were collected by field representatives under the direction of the Bureau's regional wage and industrial relations analysts. Workers were classified by occupation on the basis of the uniform set of job descriptions previously referred to.

APPENDIX B

TABLE B-1: 1/ Formal provisions for paid vacations: Percent distribution of workers in electric utilities, by region, September 1950

Vacation policy	Percent of workers in -									
	United States	New England	Middle Atlantic 2/	Border States	Southeast	Great Lakes	Middle West	Southwest	Mountain	Pacific
Plant workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
6 months' service										
Workers in establishments having paid vacations	19.7	41.3	3.7	32.4	25.3	8.5	12.9	67.3	30.9	9.1
Under 1 week	.8	-	-	-	-	-	-	9.4	-	-
1 week	16.3	41.3	3.7	21.2	25.3	8.5	12.9	40.4	30.9	7.9
Over 1 and under 2 weeks	.4	-	-	-	-	-	-	2.9	-	1.2
2 weeks	2.2	-	-	11.2	-	-	-	14.6	-	-
Having no paid vacation	80.3	58.7	96.3	67.6	74.7	91.5	87.1	32.7	69.1	90.9
1 year's service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	46.1	10.5	61.4	66.0	-	52.7	88.4	-	27.5	64.4
2 weeks	53.9	89.5	38.6	34.0	100.0	47.3	11.6	100.0	72.5	35.6
2 years' service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	11.8	-	1.9	39.2	-	27.3	12.0	-	-	-
2 weeks	3/ 88.2	100.0	98.1	60.8	100.0	72.7	88.0	100.0	100.0	3/100.0
5 years' service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2 weeks	3/100.0	100.0	3/100.0	100.0	100.0	100.0	100.0	100.0	100.0	3/100.0
Office workers										
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
6 months' service										
Workers in establishments having paid vacations	22.5	44.3	6.1	56.1	33.5	7.3	7.4	73.0	39.4	14.1
Under 1 week	.7	-	-	-	-	-	-	7.8	-	-
1 week	18.0	44.3	6.1	39.9	33.5	7.3	7.4	38.1	39.4	12.1
Over 1 and under 2 weeks	1.0	-	-	-	-	-	-	8.9	-	2.0
2 weeks	2.8	-	-	16.2	-	-	-	18.2	-	-
Having no paid vacation	77.5	55.7	93.9	43.9	66.5	92.7	92.6	27.0	60.6	85.9
1 year's service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	40.4	10.5	47.0	27.9	-	49.1	90.6	-	27.2	61.9
2 weeks	59.6	89.5	53.0	72.1	100.0	50.9	9.4	100.0	72.8	38.1
2 years' service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	7.7	-	-	8.6	-	20.1	11.9	-	-	-
2 weeks	3/ 92.3	100.0	100.0	91.4	100.0	79.9	88.1	100.0	100.0	3/100.0
5 years' service										
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2 weeks	3/100.0	100.0	3/100.0	100.0	100.0	100.0	100.0	100.0	100.0	3/100.0

1/ Revision of Table 15, Wage Structure Bulletin, Series 2 No. 79, page 19.

2/ One large firm in the Middle Atlantic region was not included in the study and no adjustment was made for its omission.

3/ Revision of previously published data.

TABLE B-2: 1/ Formal provisions for paid vacations: Percent distribution of workers in gas utilities, by region, September 1950

Vacation policy	Percent of workers in -								
	United States 2/	New England	Middle Atlantic 3/	Border States	South-east	Great Lakes	Middle West	South-west	Pacific
Plant workers									
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
6 months' service									
Workers in establishments having paid vacations	41.9	61.8	45.2	41.3	60.8	27.1	33.4	85.4	19.7
Under 1 week	1.7	7.8	1.8	-	4.6	-	6.0	-	-
1 week	40.0	54.0	43.4	41.3	51.8	27.1	27.4	85.4	19.7
Over 1 and under 2 weeks	.2	-	-	-	4.4	-	-	-	-
Having no paid vacation	58.1	38.2	54.8	58.7	39.2	72.9	66.6	14.6	80.3
1 year's service									
Workers in establishments having paid vacations	99.2	100.0	100.0	100.0	82.5	100.0	100.0	100.0	100.0
1 week	32.7	24.5	28.6	23.6	13.2	43.5	10.8	-	68.0
Over 1 and under 2 weeks	.4	-	-	-	-	-	6.0	-	-
2 weeks	66.1	75.5	71.4	76.4	69.3	56.5	83.2	100.0	32.0
Having no paid vacation	.8	-	-	-	17.5	-	-	-	-
2 years' service									
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	8.4	-	18.3	12.1	4.6	9.5	-	-	.8
2 weeks	4/ 91.6	4/100.0	81.7	87.9	95.4	90.5	100.0	100.0	99.2
5 years' service									
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	.2	-	-	-	4.6	-	-	-	-
2 weeks	4/ 98.3	4/100.0	4/100.0	100.0	95.4	100.0	73.8	100.0	100.0
Over 2 and under 3 weeks	4/ 1.5	-	-	-	-	-	26.2	-	-
Office workers									
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
6 months' service									
Workers in establishments having paid vacations	44.9	64.8	49.7	44.4	54.8	25.3	92.5	94.4	19.6
Under 1 week	.7	5.8	.2	-	-	-	8.6	-	-
1 week	40.8	59.0	49.5	44.4	51.5	21.5	28.0	94.4	19.6
Over 1 and under 2 weeks	3.4	-	-	-	3.3	3.8	55.9	-	-
Having no paid vacation	55.1	35.2	50.3	55.6	45.2	74.7	7.5	5.6	80.4
1 year's service									
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	28.8	7.4	19.8	7.7	10.4	37.2	7.5	-	75.0
Over 1 and under 2 weeks	.3	-	-	-	-	-	8.6	-	-
2 weeks	4/ 70.9	92.6	80.2	92.3	89.6	4/ 62.8	83.9	100.0	25.0
2 years' service									
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 week	4.7	-	3.1	-	-	12.6	-	-	.7
2 weeks	4/ 95.3	4/100.0	96.9	100.0	100.0	4/ 87.4	100.0	100.0	99.3
5 years' service									
Workers in establishments having paid vacations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2 weeks	4/ 99.0	4/100.0	4/100.0	100.0	100.0	4/100.0	72.9	100.0	100.0
Over 2 and under 3 weeks	4/ 1.0	-	-	-	-	-	27.1	-	-

1/ Revision of Table 34, Wage Structure Bulletin, Series 2 No. 79, page 41.

2/ Includes data for the Mountain region in addition to those regions shown separately.

3/ One large firm in the Middle Atlantic region was not included in the study and no adjustment was made for its omission.

4/ Revision of previously published data.

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INDUSTRY REPORTS: GENERAL EXPLANATIONS 1/

The 1947 Interindustry Relations Study

Introduction

This report describes in general terms the concepts followed and procedures employed in carrying on the research leading to the individual industry studies comprising the basic documentation of the 1947 Interindustry Relations Study. The initial and major objective of the BLS program in this field was the development of the empirical foundations of a set of structural relationships which would relate the transactions (purchases and sales of goods and services) among all the intermediate (processing or nonautonomous) industries of the domestic economy to one another. At the same time, transactions with final demand (autonomous) sectors would be shown in order to complete the purchases and sales pictures of each industry. The transactions data and the structural relationships (input coefficients) developed therefrom for the intermediate industries are eventually organized in square arrays in the familiar interindustry relations, or "input-output," tables. These tables are the result of analytical studies of about 500 industries.

The basic data comprising these individual industry studies have intrinsic value independent of any particular analytical purpose for which they may be employed, because each study constitutes in effect a complete current account 2/ purchasing and marketing analysis for a single sector in the 1947 base period. Despite changes which may have occurred since, the relationships presented are informative. Where changes are great, the 1947 data provide a good take-off point for applying current information in order to develop relationships more applicable to current or future periods.

1/ Prepared in the Branch of Industry Economic Studies of the Bureau's Division of Interindustry Economics by Philip M. Ritz and Gabriel G. Rudney.

2/ Although the 1947 Interindustry Relations Study collected information representing only current account transactions, capital goods were distributed only to special investment sectors. No attempt was made to distribute such capital goods to actual purchasing industry.

Generally, each industry report may be considered as comprising three sections: the general explanations applicable to each sector in the 1947 study (to be found herein); a methodological statement covering the broad area in which the industry is classified (e.g., agriculture, mining, and manufacturing); and the specific industry study, composed of a general narrative summary and detailed industry tabulations.

(a). The general explanations provide a broad background for the 1947 study, including a discussion of the period of study, coverage, classification, and sources. In addition, explanation is given of special interindustry concepts, such as valuation of production, current and capital account transactions, secondary products, transfers, and dummy industries. The valuations of various measures such as gross output, primary product shipments, marketing charges, gross inputs, cost of materials, nonmaterial inputs, and factor payments are also explained. Furthermore, the special characteristics of the final demand sectors are described.

(b). The methodological section for the broad area within which an industry is classified discusses procedures, methods, sources, and concepts which are largely standardized for all the individual sectors in the general group.

(c). The detailed industry analysis, presented in two parts, follows the methodological section. The first part is a summary statement in which the industry is defined, principal sources are listed, unique methodological implications are explained, and, where feasible, a comparison is made between BLS estimates and similar government or private estimates. In some instances, particularly for the nonmanufacturing reports, this material may include supplementary tabular presentations.

The second part consists of detailed estimates of cost structure and output distribution which are embodied in three tables: Table I--Summary of Transactions, 1947, portrays the relevant control totals from which gross inputs and gross output are derived; Table II--Inputs to the Primary Industry, 1947, describes the input structure of the industry; and Table III--Outputs, 1947, reflects the product detail and output distribution of the industry.

Period of Study

For obvious reasons, the study data almost necessarily must be compiled for a calendar year. The year 1947 was the inevitable choice as the latest year for which a complete Census of Manufactures was available. The selection of a specific time period for the study did not, of course, limit analysis exclusively to data collected for that year. Available recorded information for years other than calendar year 1947 was investigated and used as a guide in establishing the distribution of production or the details of material requirements for 1947.

Coverage

The 1947 study covered the flow of goods and services within the continental United States during that year. The coverage extended to all real economic transactions, including many for which imputations were made. Financial transactions were excluded except in a few special instances.

The American economy was divided for study purposes into two broad areas: a producing or processing area and a final demand or final consumption area. The producing (intermediate or endogenous) area encompassed the entire interrelated industrial system engaged in all forms of production and distribution ranging from the production of basic raw materials to end-product deliveries to final consumers. Included were the agricultural, mining, manufacturing, trade, transportation, utilities, and services sectors of the economy. The final demand (autonomous or exogenous) area, by definition, included those sectors of the economy--households, investors, government, and foreign countries--which consume the designated end-products of the producing area.

Classification

The system of industry classification generally employed was that which showed the greatest possible degree of industry detail within the limits of data availability. In some cases relatively unimportant industries were grouped. The final designations approximated the 4-digit level of the Standard Industrial Classification for most of the manufacturing sectors and both 2-digit and 3-digit groupings for most nonmanufacturing activities. Product groupings were used for agriculture and mining. The final industry tabulations distinguished about 450 separate intermediate sectors. Some of the final demand areas can be split further with available data so as to provide close to 500 different sectors in all.

A complete breakdown of sectors on a product basis would have provided the clear-cut differentiation best suited for economic analysis, but available statistics (primarily Census of Manufactures data in the important manufacturing area) dictated a sector classification based on operations of establishments in most of the broad areas. Thus, most manufacturing industries were classified on an establishment basis, approximating those of the 1947 Census of Manufactures.

However, numerous departures from the establishment-type classification were necessary and desirable in light of available data and special operational problems. For example, agricultural sectors were more simply represented by a commodity classification. Construction was classified on an activity basis. Trade activities were defined processes, both wholesale and retail. Mining industries were generally classified on a commodity basis, but the definitions embodied in the Standard Industrial Classification were closely adhered to so that the products were grouped in accordance with the major producing industry concept of the SIC. The BLS classification also included a few "dummy" sectors, such as waste products, which were added to the system to account for groups of items with multitudinous origins and destinations.

The final demand area was composed of six broad sectors: households, gross private capital formation, construction, inventory change, foreign trade, and government. These are similar to, but not identical with, the components of the United States Department of Commerce measure, "Gross National Product." The purchases of these sectors include the familiar personal consumption expenditures, government expenditures for goods and services, private capital formation (including net change in inventories), and United States exports. All of these are designated as end-product deliveries of the processing system to final demand sectors. The outputs of these sectors include government taxes, wages and salaries, entrepreneurial net income, other factor payments, capital consumption allowances, United States imports, and various minor items.

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INDUSTRY REPORTS: MANUFACTURING [1]

The 1947 Interindustry Relations Study

Introduction

The following report has general applicability to all of the industry studies in the manufacturing area of the 1947 Interindustry Relations Study. This, together with the more general statement, Industry Reports: General Explanations, BLS Report No. 9, is designed primarily to accompany the individual industry reports (i.e., on a 500-sector basis) in the manufacturing area. It describes those facets of the research methodology in this area which are generally applicable to all of the individual reports or which cover specific techniques that have been applied to broad subgroups in the area (e.g., important metal-using sectors, such as the machinery and metal-fabricating industries).

A manufacturing sector in the 1947 Interindustry Relations Study can be considered as the sum of two segments: the basic producing industry and the total of "transfers-in" of like or similar domestic products produced elsewhere plus competitive imports. The producing industry is defined generally on an establishment basis, usually following very closely the industrial delineations of the Standard Industrial Classification system and the 1947 Census of Manufactures. However, the basic industry was sometimes modified in varying degree from the Census industry in response to problems arising in the course of the study. These modifications usually involved redefinitions of the scope of an industry (e.g., to cover manufacturing operations performed in trade or service establishments), but they also included instances of revaluation of an industry's production in order to conform with interindustry output concepts (e.g., the valuation of toll work on a quantity basis like other operations in nonferrous metal refining).

For most of the manufacturing industries, the starting point for each industry study was the material in the published volumes recording the findings of the 1947 Census of Manufactures. This material included for each industry a number of key control totals which became the basis for the preliminary industry accounts, some of which may have been modified later in response to specific problems, as suggested above.

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[1] Prepared in the Bureau's Division of Interindustry Economics by Philip M. Ritz and Harry Shulman.

As a measure of output the Census provided data on the total value of shipments for most industries. In most cases finished goods inventory change was also recorded. For a few industries actual production rather than shipments was provided. On the cost side of each industry, Census published data on cost of materials, parts, containers, and supplies; cost of fuels and purchased electric energy; cost of contract and commission work; and wages and salaries paid. For some industries, data on consumption of selected materials were also published. This was particularly true for certain metal shapes and forms consumed by the metal fabrication and machinery industries.

Development of Gross Output

Shipments, inventories, and production--basic industry

The shipments figure generally available from the 1947 Census of Manufactures needed adjustment to a production figure and possibly other modifications before it could be used as a measure of an industry's output in the Interindustry Relations Study. Inasmuch as output was defined to refer to current production, an adjustment had to be made for finished goods inventory change. This was necessary from a slightly different point of view also in that the materials consumption data reported by Census referred to materials which went into production during the current year. In some cases this production ended up in part as an increase in finished goods inventory, and in a few cases as an increase in inventory of goods in process. Actually, the inventory adjustment needed to convert shipments to production was performed in each case for finished goods but only rarely for goods in process. The reason for this was that the inventory data reported by Census were explicit only for finished goods; the goods in process inventory was presented in combination with raw materials inventory. In only a few instances was it feasible to separate the latter.

Electric energy sales--basic industry

The shipments (and production) figures had to be modified further to take account of sales of surplus electric energy produced by many of the industries. Receipts for this item had to be included not only because they represented legitimate production but also to make output consistent with the reported fuels consumption data, which included fuels used in generating this electricity.

Modifications of Census data--basic industry

In addition to general undercoverage in the 1947 Census of Manufactures, it omitted the logging industry and certain types of manufacturing operations (such as government manufacturing activities and manufacturing operations in wholesale and retail trade) for a number of industries.

In the case of government manufacturing operations, estimates were made of several of these activities (e.g., operation of the Government Printing Office and government ordnance plants) and were incorporated with the appropriate private industry, thus augmenting both primary shipments and output of the industries involved. The activities of navy yards, however, were not added to the private shipbuilding industry because of the unavailability of information.

The omission of manufacturing operations in trade establishments was especially important in the food processing industries. Where sufficient information was available to estimate the value of such activities, such estimates were made and added to the output of the relevant industries. Among the industries for which outputs were augmented because of production in trade were the meat packing, processed dairy products, confectionery products, and baking products industries.

As to the general undercoverage in the 1947 Census of Manufactures, it was estimated by the Bureau of the Census that about 10 percent of the manufacturing establishments were not covered. It is believed, however, that in terms of value of products the undercoverage was much less serious, probably less than 2 percent; hence no general across-the-board adjustment was made. For a few specific industries, including sawmills, some estimate of the undercoverage was made and added to the total output of the relevant industries.

Another modification of the output of an industry was by revaluation, such as was generally done for nonferrous metals processed on a toll basis by the nonferrous smelting and refining industries. In the 1947 Census of Manufactures metals processed on a toll basis were included in the output values of the relevant industries to the extent of toll receipts only. This raised a problem in assigning values to the quantities of metals allocated to the various consuming industries. The combination of outputs with such substantially different sets of unit values (i.e., toll vs. non-toll) would have created a serious heterogeneity in the product composition of each of the affected industries. Shifts in the proportions of toll and non-toll output in later years could cause serious problems in translating the dollar output of the industry into physical quantities. Hence, a full commercial value was imputed to the metals processed on a toll basis, thus increasing the output of the relevant industries by an amount equal to the excess of the imputed value over the corresponding toll receipts. In order to balance the increased output figure, it was also necessary to make a corresponding entry on the input side and to increase the control total for cost of materials accordingly.

In the case of the logging industry, which had been completely omitted from Census coverage, an estimate of its output was prepared and the sector included in the Interindustry Relations Study.

The estimating details relating to the above enumerated modifications are explained in considerable detail in the appropriate industry reports.

Additions to basic industry--"transfers-in"

After the basic industry was defined, certain additions to each industry's primary production were considered. These additions, labeled "transfers-in," were made necessary by the need to consider the allocation of like or similar products produced by other industries or imported. The most common transfers-in were the so-called "secondary products" of other domestic industries and the "competitive imports" from the foreign trade sector. There were a few domestic transfers-in other than secondary products that also had to be considered. This general area of consideration is discussed in Industry Reports: General Explanations, BLS Report No. 9, but the incidence is so general in the manufacturing sectors as to require a more detailed discussion here.

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